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OFFICIAL ORGAN OF THE NORTHWEST FRUIT GROWERS ASSOCIATION

VOLUME FIVE

NUMBER FOUR

10 CENTS A COPY DOLLAR A YEAR

BETTER FRUIT

OCTOBER 1910

ORCHARD HEATING NUMBER



ORCHARD HEATERS IN ACTION ON THE WESTERN SLOPE OF COLORADO

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PUBLISHED BY

BETTER FRUIT PUBLISHING COMPANY
HOOD RIVER, OREGON

Own an Irrigated Fruit Orchard

in the famous

Bitter Root Valley

And Provide an Annuity for Old Age

We will plant and take care of the land during the growing period, turning over to you a bearing orchard, which will thereafter yield a competence for life. Easy terms

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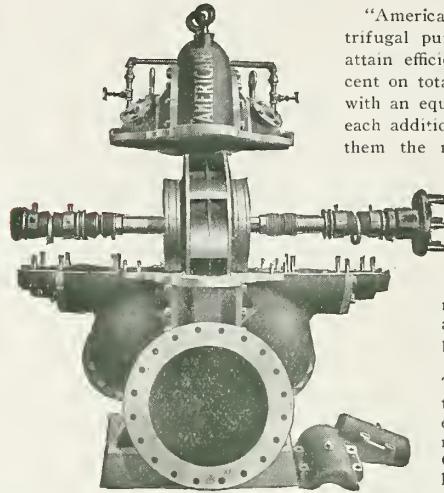
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Hamilton, Montana

First National Bank Building, Chicago

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"American" single stage centrifugal pumps are guaranteed to attain efficiencies of 60 to 80 per cent on total heads up to 125 feet, with an equal increase in head for each additional stage, which makes them the most economical pump made for irrigation purposes.

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Send for our circular "A Trip Through the Valley"

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401 Sprague Avenue

SPOKANE, WASHINGTON

NORTHWESTERN FRUIT EXCHANGE

EXECUTIVE OFFICES:

SPALDING BUILDING, PORTLAND, OREGON

OFFICERS

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THE NORTHWESTERN FRUIT EXCHANGE has been organized for the purpose of uniting the interests of the whole fruit-producing Northwest, and to adopt a system of marketing the Northwestern fruit throughout the markets of the United States and Canada.

Operating through a system of branch sales offices, in charge of **salaried managers**, and by means of traveling salesmen, the most comprehensive development of the demand can be accomplished, and in this manner only can the highest possibilities of the fruit industry be achieved.

The Exchange urges the individual shippers at all points to organize themselves into local associations, by means of which a standard, uniform pack and grade may be achieved, and brands adopted which may be advertised and established in the markets of the world, representing a definite standard of value to the absent buyer, thereby making it possible to market the fruit f.o.b. shipping point. The following well known growers' associations are members of the Exchange:

Ashland Fruit and Produce Association, Ashland, Oregon
 Dalles Fruit Growers' Association, The Dalles, Oregon
 Dufur Valley Fruit Growers' Union, Dufur, Oregon
 Yakima County Horticultural Union, North Yakima, Washington
 Cashmere Fruit Growers' Union, Cashmere, Washington
 Walla Walla Fruit and Vegetable Union, Walla Walla, Washington

Stevens County Fruit Growers' Union, Myers Falls, Washington
 Caldwell Fruit Growers and Producers' Association, Caldwell, Idaho
 Council Valley Fruit Growers' Association, Council, Idaho
 Dryden Fruit Growers' Union, Dryden, Washington
 Manville Fruit Company, Boise, Idaho
 Judge Fremont Wood, Boise, Idaho
 C. M. Kiggins, Boise, Idaho

The Exchange wishes to go on record in the statement that with the vast increase in the acreage throughout the Northwest, profitable operations in the future are going to depend on the character of the fruit shipped to the markets. The law of the "survival of the fittest" will surely operate in this business, as in any other, and the Exchange will stand always for the betterment of the product.

The Exchange has already completed arrangements for representation, through **salaried sales agents**, in the following markets: New York City, Chicago, Pittsburgh, Pa., Cincinnati, Washington, D. C., Jacksonville, Fla., Buffalo, N. Y., Minneapolis, Minn., Portland, Oregon.

Believing that there are a large number of towns which have never heretofore bought Northwestern apples in car lots, the Northwestern Fruit Exchange has inaugurated the most comprehensive selling campaign ever attempted. It has four expert salesmen on the road, covering every town large enough to support a wholesale grocer, in the following states: Iowa, Nebraska, Kansas, Missouri, Oklahoma, California, Arizona, New Mexico, Texas, Louisiana, Mississippi, Georgia, Alabama, Kentucky, Tennessee, Indiana, Ohio. Orders are coming in from our salesmen and we are placing cars at good values, and effecting a very wide distribution, and at the same time conducting a thoroughly educational campaign.

The Northwestern Fruit Exchange is managed by its Board of Directors, comprising a number of the best known fruit growers in the whole Northwest; the administration of the affairs of the Exchange will be in the hands of these men, solely, and every move made will be made in the interest of every man connected with the industry.

The Northwestern Fruit Exchange offers its facilities for the season of 1910 to such associations or groups of growers who will undertake to live up to its specifications and instructions in regard to the gathering, packing and grading of the fruit—who realize the importance of properly preparing their fruit for the market, and who stand ready to support and co-operate in a movement which is conceived in the interest of the whole industry.

ADDRESS ALL COMMUNICATIONS TO

NORTHWESTERN FRUIT EXCHANGE

908, 910, 911, 912 Spalding Building

PORLTAND, OREGON

BRANCH OFFICE:

NORTH YAKIMA, WASHINGTON, MR. B. U. YOUNG, MANAGER

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W. R. Johnston, Cashmere, Washington

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to the Highest Class Consuming
Clientele on Both Hemispheres

The largest and most extensive fruit concern in the world
operating in all the fruit growing sections of the civilized globe

STEINHARDT & KELLY Handle More

BOX APPLES

Than any Other Concern in the Country

and was the first fruit house to extensively introduce the Northwestern product to the consumers of the East. With able representation in all the leading markets Steinhardt & Kelly are enabled to handle the entire crops of the most extensive districts with utmost ease and celerity

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We Want all Shippers of Green and Fresh Fruits to Write Us
Auction Facilities Unequalled by Any House in America

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We handle thousands of cars of fruit yearly, apples, pears, peaches, prunes, etc.

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Apples for American and Foreign Markets

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Market quotations and full particulars on application

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*Wholesale Commission
Shippers' Marketing Agents
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Our Own Cold Storage Plant on Premises

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**LINDSAY
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Wholesale Fruits

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Established in Helena Quarter of a Century

Branch houses: Great Falls, Missoula and Billings, Montana

**Ryan & Newton
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Wholesale Fruits & Produce

Spokane, Washington

We have modern cold storage facilities essential for the handling of your products

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Superior facilities for handling

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APPLES AND
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Prunes, Apples, Pears, Peaches

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WRITE FOR OUR DISTRIBUTING CONTRACT

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Largest Handlers of Pacific Coast Fruits in the East

REPRESENTING THE FOREMOST WESTERN SHIPPING COMPANIES AND ASSOCIATIONS
ON THE NEW YORK MARKET

Operating in All Producing Sections

Reliable

Experienced

Prompt

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Apple Merchant

LEADING CONNECTIONS
THROUGHOUT EUROPE

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If you want good prices get into touch with me at once. I will market
your fruit either in New York or any market in Europe.

Richey & Gilbert Co.

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Growers and Shippers of

YAKIMA VALLEY FRUITS
AND PRODUCESpecialties: Apples, Peaches,
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ESSENTIAL FOR HANDLING YOUR PRODUCTSA strong house that gives reliable market
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Grade and Pack Guaranteed

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Top Prices and Prompt Returns
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SPECIALISTSWe have Apples in our store
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We make a specialty
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**THE
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WE have storage space for
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we charge you regular commis-
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no commission. Look us up.

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Are solicited, all your shipments
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Davenport Bros.

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FRUIT &
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*Growers and Shippers of the Famous
Mosier Valley Fruits*

**Rogue River Fruit and
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C. W. WILMEROTH, Manager

Main Office, Medford, Oregon

We will distribute the entire output of the
Rogue River Valley—The world's most fam-
ous pears—Our Spitzenergs won first prize
in 1909—We use the Revised Economy Code

Loading Stations

Ashland, Medford, Grants Pass, Eagle Point,
Gold Hill, Central Point, Talent, Woodville,
Phoenix, Voorhies, Merlin and Jacksonville.

**YAKIMA COUNTY
HORTICULTURAL
UNION**

North Yakima, Washington

C. R. Paddock, Manager

Apples, Pears, Peaches, Cherries,
Plums, Prunes, Apricots, Grapes
and Cantaloupes

Mixed carloads start about
July 20. Straight carloads in
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best grade; pack guaranteed

We use Revised Economy Code

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**COMMISSION MERCHANTS
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**WHOLESALE FRUIT
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We want the best pack and quality

Apples Pears Peaches

*We have modern cold storage facilities
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*We make a specialty of***Western Fruits**

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We have our representative in field

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California, Oregon, Washington, Idaho and Florida fruits. Apples handled in all European markets. Checks mailed from our New York office same day apples are sold on the other side. We are not agents; we sell apples. We make a specialty of handling APPLES, PEARS AND PRUNES on the New York and foreign markets. Correspondence solicited.

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DO YOU KNOW HOW

We have secured such satisfactory results for the growers whose fruits we have handled for several years?

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CAPITAL AND SURPLUS \$300,000.00

GAMBLE-ROBINSON COM. CO.

Incorporated
MINNEAPOLIS, MINNESOTA

Box Apples Pears Prunes Peaches

We handle over 3,000 cars annually and need heavier supplies

Associate Houses: Gamble-Robinson Co., Oelwein, Iowa; Gamble-Robinson Fruit & Produce Co., Pipestone, Minnesota; Gamble-Robinson Fruit & Produce Co., Mankato, Minnesota; Gamble-Robinson Fruit Co., Miles City, Montana; Gamble-Robinson Fruit Co., Aberdeen, South Dakota; Gamble-Robinson Company, Rochester, Minnesota; Gamble-Robinson Fruit Co., St. Paul, Minnesota.

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Ship Your APPLES and PEARS to the Purely Commission and Absolutely Reliable House

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COVENT GARDEN MARKET
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Capital and Surplus \$75,000.00

H. J. BIGALOW, Secretary and Treasurer

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Any reliable house in our line in the
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The Producers' Fruit Company, Sacramento, Cal.
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APPLES

Plums Prunes Pears Oranges Lemons

We have the largest and best trade in the Cleveland territory; our facilities are unsurpassed
We have had years of experience in handling box apples and fancy fruits

WE SOLICIT YOUR CORRESPONDENCE AND SHIPMENTS

\$1000

PER ACRE NET

\$1000



MOSIER APPLES AT HOOD RIVER FAIR

This is not an unusual profit for producing apple orchards in Oregon. It is a perfectly possible profit for any man of persistence and common sense who will select land in a proven apple district in Oregon and develop it properly. If you are at all interested in fruit growing we advise you to investigate the Mosier Valley. This valley adjoins the famous Hood River Valley, and is properly a part of it, so far as the character of the soil and the quality of the fruit produced is concerned. We claim that the apples produced in Mosier Valley are second to none and that there is no section anywhere which offers the fruit grower a greater opportunity. Land in the Mosier Valley can be obtained for very low prices, and can be cleared with comparatively little effort. These lands can be made to increase in value from 100 to 500 per cent in two years by clearing and planting trees. We invite the most careful and critical inspection of Mosier Valley, confident of the outcome. For full particulars about this Valley address

SECRETARY MOSIER VALLEY COMMERCIAL CLUB

MOSIER, OREGON

COME TO MOSIER NOW

For now, as at no other time in the year, will we be able to show you what the Mosier country can do in the raising of the finest Spitzemberg and Yellow Newtown apples on earth.

While the highest prices are paid for the MOSIER APPLES, still good land may be had here at a LOWER PRICE than in any other PROVEN APPLE DISTRICT in the Pacific Northwest.

One of the largest apple-buying firms in the United States—Sgoble & Day, New York—says: "AS FAR AS SPITZEMBERGS ARE CONCERNED, WE CAN ONLY REPEAT WHAT WE HAVE TOLD YOU, i.e., WE CONSIDER YOU HAVE THE FINEST SPITZEMBERG GROWN IN THE UNITED STATES."

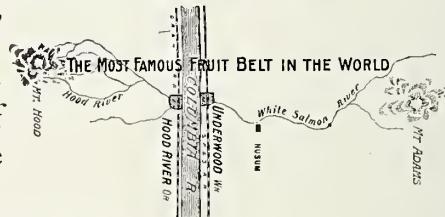
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NO TROUBLE TO ANSWER QUESTIONS

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The Gateway to the Famous White Salmon Valley

If you want a strictly first-class location for growing high-grade fruit, close to the river and railroad, within sight of the town of Hood River, with the best of everything in the way of shipping and social advantages, call on or write



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APPLES

WE WANT THE BEST
THE MARKET PROVIDES

FLIEGLER & CO.
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MEMBERS ST. PAUL BOARD OF TRADE

GIVE US A TRIAL

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Are selling fast. Our prices, terms and location are right. We have a booklet with handsome cover giving you information about these, also a catechism of questions and answers concerning Apple Orchard Lands, and a pamphlet showing many ways of making money while the trees are coming into bearing. If you are a prospective customer we would be pleased to send these to you.

OREGON APPLE ORCHARDS CO.

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Portland, Oregon

"THE LAND WHERE THE RAIN AND SUNSHINE MEET"

LYLE, WASHINGTON



A YOUNG ORCHARD NEAR LYLE

A land wonderfully favored in climate, soil and environment. Apples and all tree fruits grow to perfection without irrigation. Lands for wheat raising, hay and dairy farms. Also for small fruits.

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Lyle, Washington

Lyle Fruit Lands

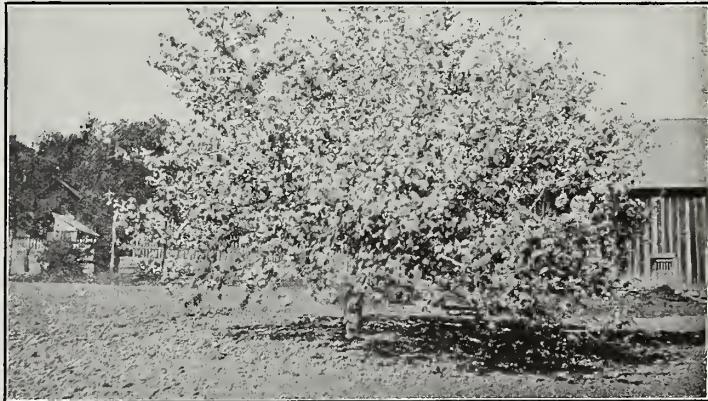
Where "The Rain and Sunshine Meet"

First Prize at the National Apple Show

Across the Columbia from the famous Hood River, Oregon, orchards. Apples, pears, peaches, without irrigation. Unsurpassed soil, climate and scenery. Also wheat land and stock ranches. Write or call on

MORGINSON, DAYTON & CLARK

Lyle, Washington



A LYLE APPLE TREE IN BLOSSOM

Hood River as an Apple Producing Country

There are 10,000 acres of apple orchards in Hood River Valley and only 1,000 acres are bearing. Improved land is selling here NOW from \$800 to \$2,000 per acre and raw land from \$60 to \$500.

What will be the value of these orchards in five years from now? Reason this out for yourself: One orchard of eleven acres in one season netted its owner \$4,000; another, from 346 trees, in one season brought \$4,700; still another, of thirty acres, in 1908 netted its owner \$11,332.

Isn't this a fair rate of interest to receive for such a small investment? Looks rather large, doesn't it? If you are interested in orchard lands, drop up a card and we will send you booklet and literature which contains some very interesting facts concerning this wonderful little valley.

JOHN LELAND HENDERSON, Inc., Hood River, Oregon

Dealers in First-class Real Estate

H. N. HACKETT, Sales Manager

Own an Irrigated Orchard

Only \$12.50 per Month

ARCADIA

Is located right in the heart of the fruit belt—twenty-two miles north of Spokane. Best soil for raising commercial apples. Land irrigated by gravity. FREE WATER. No maintenance charge. We plant, cultivate and take entire charge of your orchard for four years—so you can stay where you are, and when your orchard is in full bearing you will make big profits. Get our booklet—tells all about Arcadia.

ARCADIA ORCHARDS CO.

HYDE BLOCK, SPOKANE, WASHINGTON

Gentlemen: Please send me your Booklet "A."

Name

Address

WHITE SALMON, WASH.

THE TWIN VALLEYS

WHITE SALMON

HOOD RIVER

These two valleys are twins in location—the Hood River flows from Mount Hood north to the Columbia, the White Salmon River flows from Mount Adams south to the Columbia; they are directly opposite each other, with the Columbia River flowing between. They are twins in soil, climate, scenery, transportation facilities, intelligent class of residents and in the high grade of non-irrigated fruit grown, but they are NOT TWINS IN THE PRICE OF THEIR APPLE LANDS. White Salmon Lands may be bought of us for ONE-HALF and less of the price asked for no better land in the Hood River district. Let us demonstrate the truth of this statement by showing you the lands listed below.

549—10 ACRES, 7 miles from White Salmon; a fine view of the White Salmon Valley, Mount Adams and Mount Hood; 2½ acres set to Spitzenberg and Yellow Newtown apples; small 3-room house, fruit cellar, good well; red shot soil; only 2½ miles from Husum; 3 acres of the 10 are under plow, 9 acres have been slashed and burned. This is one of the best small tracts, partly improved, on our list. Present price only \$2,750, on easy terms.

553A—10 ACRES of first-class fruit land, only 6 miles from White Salmon, on county road, 1¼ miles from the Glavis orchard. This tract has no waste land, is in a good district, and the present price is only \$125 an acre; one-half cash, balance 3 years, 8 per cent.

580—10 ACRES, 2 miles from White Salmon; flowing spring water, red shot soil; bearing orchard of Spitzenberg and Yellow Newtown apples on ranch adjoining; fine view of Mount Hood and Columbia River when timber is removed. Another 10 acres can be had adjoining this tract if desired. Price only \$125 an acre; one-half cash, balance 3 years, 8 per cent.

550A—20 ACRES, with 12½ acres under plow; 10 acres in young Spitzenberg and Yellow Newtown apples, 3 acres in bearing strawberries; house, stable and well; red shot soil. Only 2 miles from White Salmon. Price \$325 an acre; one-third cash, balance 3 years, 8 per cent.

553—20 ACRES, 5½ miles from White Salmon by new county road; red shot soil, on county road, ¼ mile from the Glavis orchard. This tract has no waste land, is in a good district, and the present price is only \$125 an acre; one-half cash, balance 3 years, 8 per cent.

W519—160 ACRES, 6 miles from the Columbia River and North Bank Railway; creek flows through the property; red shot and volcanic ash soil; tract that is adapted to subdivision; only ½ mile to the White Salmon River. If sold within 30 days, price only \$62.50 per acre; one-fourth cash, balance 3 years, 8 per cent.

516—30 ACRES, 1 mile from Husum, 6 from White Salmon, ½ mile to White Salmon River; on county road; all but 4 acres nearly level; two all-year springs; good soil. Mail and stage each day except Sunday between White Salmon, Husum and Trout Lake. Land on three sides is cleared and set to orchards. This piece has been tied up until recently, but can be bought, if taken soon, at \$140 an acre, on easy terms.

587-588—TWO 40-ACRE TRACTS (80 acres), 6 miles out; 1 mile to store and post office of Bristol; county road on one side; brush land, easily cleared. Will sell 20 acres or more of this tract at only \$100 an acre, on easy terms.

534—80 ACRES, 45 of which is good apple land, 35 rolling; deep red shot soil; elevation 1,400 feet; 50 acres easily cleared; spring water; 2½ miles from Husum, 8 miles from railroad station on North Bank Railroad. A snap at \$37.50 per acre; half cash, balance 3 years at 8 per cent.

583—80 ACRES, all good orchard land, excepting 3 acres which is low, making good hay land; elevation 1,600 feet; deep red shot soil; 2 acres in cultivation; 4-room plastered, frame house, which cost \$100; log barn; 12 acres brush land, which is easily cleared; all year spring; mail delivered tri-weekly. A first-class county road suitable for automobile use passes within ½ mile of this tract; only 8 miles to the Columbia River and North Bank Railway; 1½ miles to Snowden post office; fine view of Mount Adams. Price for 30 days only, \$47.50 an acre, on easy terms.

600—80 ACRES, 8 miles from White Salmon, 2½ miles from Husum; fine view of Mount Adams and Mount Hood; soil red shot, spring water the entire year; over 50 acres orchard land, balance pasture. Present price only \$48 per acre; one-third cash, balance 3 years, 8 per cent.

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20 ACRES, 7 miles southwest of Hood River; red shot soil, good drainage; close to school and store; 4 acres Newtowns and Spitzenergs, 1 year old; 12 acres slashed and burned; balance light timber; spring water; good location. A bargain at \$5,000; \$2,000 cash will handle it.

10 ACRES, 3 miles southwest of Hood River; all set to Newtowns and Spitzenergs, in good condition; volcanic ash soil, good drainage; on main county road. This is a snap at \$7,000; \$3,000 cash will handle it.

20 ACRES, 9 acres set to commercial orchard, mostly three-year-old trees; 3 acres young strawberries; 5 acres partly cleared, balance in meadow; water stock; small house; near school, store and railway station. Price \$10,000; \$4,600 cash.

75 ACRES, beautiful modern home, $2\frac{1}{2}$ miles from town; 30 acres under cultivation; 16 acres in orchard in prime condition, part full bearing; 14 acres in meadow. Place will show profit this year of over \$5,000 on the crop. Team and all implements included. Price \$35,000.

30 ACRES, best red shot soil, scientifically planted to standard commercial orchard, some full bearing; living stream of water, close in; genuine bargain. \$23,000; very good terms.

15 ACRES, all planted to Newtowns and Spitzenergs, 1 to 4 years old, save $\frac{1}{2}$ acre in meadow; close to town; red shot soil. Price \$11,000; \$4,000 cash.

20 ACRES, unimproved, 6 miles south of Hood River; good drainage, excellent location; all under ditch and A1 orchard land. Good buy at \$3,500; \$1,250 cash, balance 3 or 5 years.

10 ACRES, near school, store and railway station, on main road; good soil, good drainage; all set to 2-year-old Newtowns and Spitzenergs; excellent condition; beautiful building site. Price \$5,500; \$1,500 will handle it.

20 ACRES, partly improved; red shot soil, high and sightly; perfect drainage. This tract lies fine for orchard; beautiful building spot. Genuine bargain at \$350 per acre; \$2,000 cash.

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BETTER FRUIT

A MONTHLY ILLUSTRATED MAGAZINE PUBLISHED IN THE INTEREST
OF MODERN AND PROGRESSIVE FRUIT GROWING AND MARKETING

PROTECTION OF FRUIT CROPS FROM FROST INJURY

BY O. W. WHIPPLE, BOZEMAN, MONTANA, FORMERLY OF COLORADO AGRICULTURAL COLLEGE

TO the Western fruit grower, the subject of frost protection, or frost fighting, is no longer a new one. And as much as he may wish to, it is doubtful if the fruit grower of the West will soon forget the strenuous times of the last three years, and again be found without some means of protecting the orchard from late spring frosts. Surely frosts are no more frequent now than in years past, but the Western fruit grower of today has much more capital invested than the fruit grower of some years ago. The cost of running the orchard is also much heavier than it was ten years ago. This being the case, the loss of a fruit crop is a more serious financial loss. Then, too, well developed fruit growing communities, where the loss of a fruit crop is a calamity to all living within that community, are of comparatively recent development in the West. The fruit grower no longer doubts the wisdom of investing money in spraying machinery, and why not protect the orchard from frost, when efficient means of protection are available. Some fruit growers have feared that to equip the orchard for frost protection was to admit that their locality was subject to frost and that land values would depreciate. But the fact that the merchant insures against fire does not injure his business nor his credit.

Many methods of frost protection have been proposed and tested. Most of them have proven more or less efficient, but space will permit of only passing mention for most of them.

Many localities are favored with more or less natural protection. Such favored sections are generally either narrow canons, where the canon breezes keep the air stirring and prevent the colder air from settling, areas near large bodies of water which absorb a large amount of heat during the day and give it off gradually during the night, or areas near large cliffs that afford protection similar to that furnished by large bodies of water. But experience has proven that natural protection cannot be relied upon. There are few, if any, localities that always escape untimely frosts.

Many fruit growers still cling to the idea that frost injury may be averted by retarding the blooming season. It is true we might if we had some practical means of retarding the opening of the buds. But, with the possible exception of small fruit plants that may be completely cov-

ered, we have found no practical means of retarding the bloom until all danger of frost is past.

In irrigated sections, the use of irrigation water is sometimes suggested as a means of saving the fruit. Running irri-

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gation water in the orchard on a frosty night may help, but would not be safe protection when more than two or three degrees of frost is expected. Water, run among low plants like strawberries, may be quite a protection.

Probably no means of frost fighting has been more thoroughly tested than has smudging. This term is applied to the system of protection where some fuel is burned with the intention of forming a blanket of smoke over the area to be protected. In this way the fruit grower artificially provides the protection of a cloudy night. The cloud of smoke hangs over the orchard, and, like the

clouds, prevents rapid radiation of heat from the earth. In many cases this has proven adequate protection, and in many cases it has proven a disappointment. This means of protection is efficient only when a few degrees of frost is expected. And even then a great deal depends upon concerted and early action. Smudging fuel is hard to obtain in any quantity, but where no other means of protection is at hand, it is well worth trying. For fuel one may use any material that will give a dense smoke in burning. Damp straw or manure, bailed hay or straw, and rubbish are often used. Where this system is to be employed, every effort should be made to get concerted action, for smoke, like rain, may fall alike on the just and unjust, and the smoke you make may drift over your neighbor's orchard while he is enjoying a good sleep.

And most important of all, do not wait too long before starting the smudge. As the object is more to conserve than to generate heat, the fires must be started before the danger point is reached. Then do not give up, for a cloud of smoke may screen the trees from the early morning sun and save a crop of fruit, although it may be slightly frozen.

Orchard heating is probably a more recent introduction in the way of frost protection. It is now quite generally



FIGURE 1—TROUTMAN HEATER

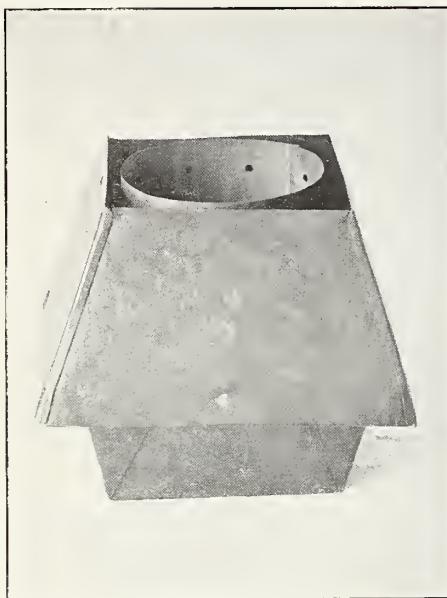


FIGURE 2—NATIONAL ORCHARD HEATER

confused with smudging, and the receptacles in which fuel is burned are often spoken of as smudge pots, when they might be more properly called orchard heaters. The fuel is burned for heat, not smoke, and the benefit derived no doubt comes from actually heating the surrounding atmosphere. Any combustible material may be used for fuel, and may be burned in heaters designed for the purpose or in small piles upon the ground. During three years' experience in Western Colorado, where probably more orchard heaters are now in use than in any other equal area in the United States, the writer has had many opportunities to see the efficiency of these heaters in actual use.

While any fuel may be burned, coal and crude petroleum have been most extensively used, and heaters have been designed largely for these fuels. As much as we would like to be impartial in the matter, we must say that crude oil is the more practical fuel to use. Its use, however, will probably be limited to areas where it can be procured at a cost not to exceed five or six cents per

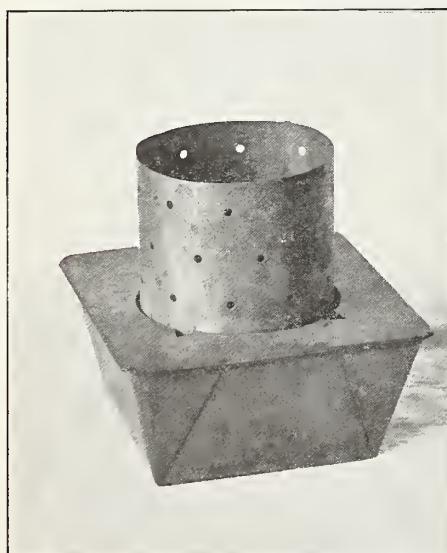


FIGURE 3—NATIONAL ORCHARD HEATER

gallon. This means that it cannot be shipped long distances, and its use will therefore be limited to areas near oil fields. Oil is the more satisfactory, as oil burners are now manufactured that hold enough oil to burn through the night, while coal burners require re-filling every three or four hours.

While the heaters figured are by no means all the heaters on the market, they represent those that have proven the most satisfactory.

Figure 1 is of an oil burner which will hold a gallon of oil, and will burn for a period of about six hours. It does not consume fuel as rapidly as some others, and is generally recommended at the rate of from 100 to 120 per acre.

Figures 2 and 3 are of the National Orchard Heater, designed for burning oil. In one case the hood is shown which serves as a protection in stormy weather. This is left on the heater while it is burning and may be turned to give the fire more draft. This heater holds one and one-half gallons of oil, and will burn for a period of from six to seven hours. A larger size may be procured. It probably consumes the oil better than any other heater and gives off less smoke. Eighty to the acre is ample protection.

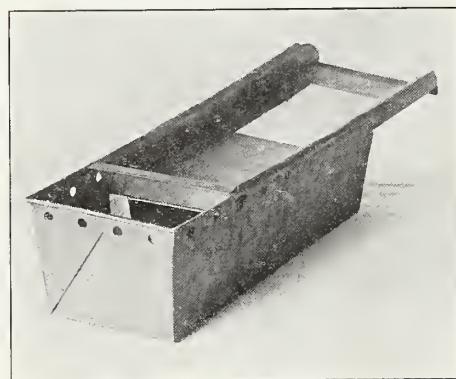


FIGURE 4—HAMILTON ORCHARD HEATER

Figure 4 is another oil burner designed with a sliding cover. It holds ten quarts of oil and the period of burning will vary with the size of surface exposed when the lid is pulled back. Opened, as shown, it will consume a little over a quart of fuel per hour. The oil is well protected from the weather, and on account of the sliding cover, the heater has unlimited capacity for burning oil. For this reason, fifty heaters per acre is considered ample protection. The same heater, spaced at the rate of fifty per acre, is shown in Mr. Hamilton's own orchard in Figure 7.

Figures 5 and 6 are of the two most satisfactory coal burners. Each holds from twenty-five to thirty pounds of coal and will burn for a period of about three and a half hours without refilling.

Figure 5 is filled and ready for lighting. It will be noticed that the kindling is in the bottom of the heater and the oil soaked waste protrudes from one of the openings. All that is necessary to start the heater is to touch a torch to this waste. The ashes drop out as the coal burns. In case the heater clogs up, a little jarring will generally clean out the ashes.

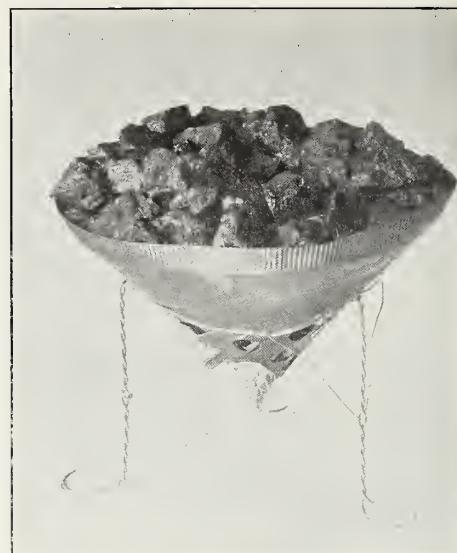


FIGURE 5—IDEAL ORCHARD HEATER

Figure 6 does not clean as easily, but as the draft holes extend well up the sides, there is generally little trouble caused by ashes filling up below.

The heaters are nearly equal in their ability to consume fuel, and should be used at the rate of about fifty per acre. The heater illustrated in Figure 5 is shown properly spaced in an apple orchard in Figure 9, and the one shown in Figure 6 will be seen distributed in a pear orchard in Figure 8.

In deciding whether to buy a coal burner or an oil burner, the fruit grower must first consider the matter of fuel. If oil is available at a reasonable cost, I think oil burners will prove more satisfactory, especially in large orchards. With an equipment of oil heaters having the capacity to go through the night without refilling, the amount of help required will be about one man to each five acres. When coal is used, it will take about twice this amount of help. Oil properly stored from year to year will probably deteriorate less than coal. One will secure about as much protection from a ton of coal as from 100 gallons of oil, so their cost is about equal

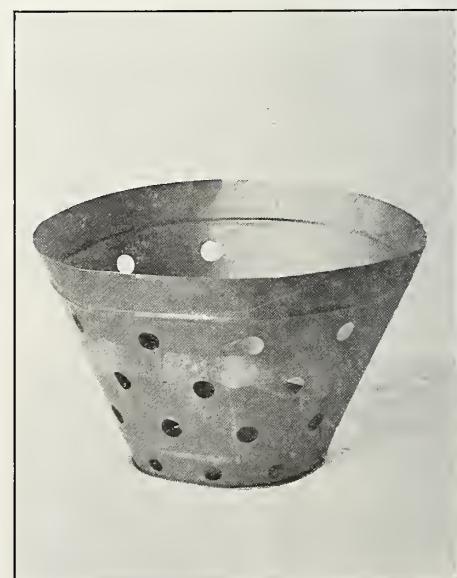


FIGURE 6—OLSON'S ORCHARD HEATER

with coal at \$4.50 per ton and oil four and one-half cents per gallon.

After one has decided upon a heater, the next matter is the proper storage of the proper amount of fuel. Eighty quarts of oil, or, in other words, eighty heaters, each burning a quart of oil per hour, should protect one acre for one hour with a temperature of 20 degrees. Thirty hours should be about the maximum number of hours it will be necessary to burn during any one season. This means that to be safe, one should store about 500 gallons of oil or five tons of coal for each acre of orchard. Many years only a small portion of this would be used. Oil may be stored in cement cisterns or in galvanized tanks. Coal should be stored under shelter. Coal heaters require a fairly good grade of coal, one containing not over 15 or 20 per cent of slack.

The cost of equipping with these heaters should be about \$25 per acre, and suitable storage may be supplied for fuel at about \$7.50 per acre.

Where oil is used, a tank should be provided. This need not be expensive. It may be supplied with an outlet, from which the oil may be drawn into buckets and carried to the heaters, or with long hose with shut-offs at the end. The latter is the more convenient arrangement. With such a tank, two men will fill the heaters on twenty acres in a day. If the oil is in cisterns, the filling pump on the gasoline spraying outfit may be brought into use to pull the oil from the well. A convenient method of refilling coal heaters is to haul the coal to the orchard in a sled or wagon. One man drives and fills the buckets, while other men distribute the coal from the buckets. Coal for refilling may be placed about the orchard in sacks, as shown in Figure 9. This saves having the team in the orchard at night.

The management of these heaters is not a very difficult task. Still one who has just equipped with new heaters



FIGURE 8—HEATERS WHICH SAVED A CROP OF PEARS, WITH A TEMPERATURE OF 20 DEGREES, ON DAY AFTER PICTURE WAS TAKEN

should fire a few of them before the frost-fighting season is on, to determine how they are going to act. There are many little tricks to be learned in starting the coal heaters, at least. All these heaters are supplied with covers and may be filled and placed in the orchard ready for use. Kindling must be provided for the coal burners. Good, dry tree prunings make very good kindling. First, a little oil-soaked waste should be placed in the bottom of the heater and fixed to protrude from one of the holes. A handful of kindling is placed upon this and then the heater is filled with coal. The heater shown in Figure 5 is in most cases filled with an opening coming up through the coal in the center. The other coal heater illustrated is generally filled with the kindling on one side. Oil

heaters are started easily by dropping a little gasoline on the surface of the crude oil at the time of lighting, or by throwing in a little waste or straw. After the crude oil is well warmed up, it burns readily from the surface. When waste is used, it is a good plan to hang it by a wire to the edge of the heater so it will be partially submerged in oil. The heaters are then quickly lighted with a torch.

The heaters need not be started until the danger point is reached. Both the coal and oil burners soon begin to give off heat. Most oil heaters may be extinguished at any time by putting on the lid. When a coal heater is once fired, it may about as well be allowed to burn out. They may be turned over when the fires are no longer needed, but the fuel saved does not burn well. It may be used for refilling during the night while the heaters are burning.

The orchardist should supply himself with a good thermometer or a frost alarm. The frost alarm may be set to ring when the temperature reaches any point. The alarm is placed in the house and will easily awaken anyone who is expecting an alarm.

This about completes the equipment for frost-fighting. The help of the community should be organized and properly distributed. Keep in touch with the Weather Bureau and if possible establish headquarters where two or three good, level-headed men may keep in touch with the whole community by telephone, and answer inquiries and give out information.

[Editor's Note: This splendid article will be followed in the November edition by one on frost injuries (with illustrations) by Professor Whipple, who conducted this line of observation and research work with the Colorado Experiment Station. He now is horticulturist for Montana Agricultural College, at Bozeman.]



FIGURE 7—HEATERS WHICH SAVED A \$7,500 CROP OF APPLES WITH AN OUTLAY OF LESS THAN \$500. TEMPERATURE 20 DEGREES AT BLOOMING TIME

THE USE OF OIL AS FUEL FOR ORCHARD HEATING

BY GEO. C. RICHARDSON, KANSAS CITY, MISSOURI

THE large and increasing production of oil in almost every section of the United States, namely: The Eastern states, where is found the great oil fields of Pennsylvania, New York and

find oil produced in considerable quantities in Kentucky, Michigan, Colorado and Wyoming.

Most of these states have a network of pipe lines that transport the crude oil across the country to tidewater, with refineries at logical points along these pipe lines for the refining of the crude product into illuminating, lubricating and fuel oils. As an illustration, the Mid-Continent oil field has pipe lines running from Oklahoma to the Gulf of Mexico, and another great pipe line system from Oklahoma and Kansas to Whiting, Indiana, and from there is a pipe line to Bergoune, New Jersey (tidewater). Along this route we find numerous refineries, such as Neodesha, Kansas; Sugar Creek, Missouri; Whiting, Indiana, and Cleveland, Ohio, and similar conditions for refineries exist in other fields.

So it can be readily seen that oil for fuel is within easy reach of every fruit producing section of the United States; and for economy in use, when labor handling is taken into consideration, it is very much superior to wood or coal, besides other benefits that will be mentioned.

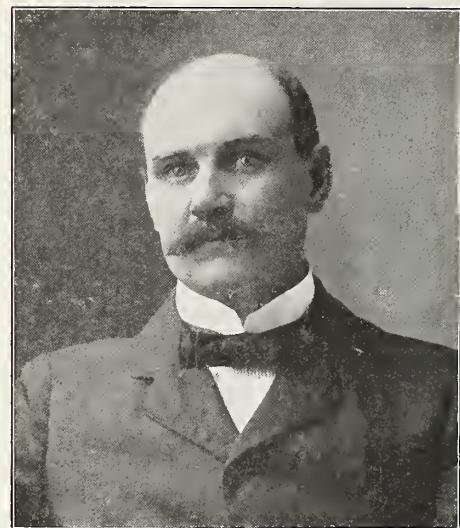
These numerous oil fields, or pools, in the different parts of the United States produce from light to heavy gravity oils, ranging from fifteen to forty-five specific gravity. Some have a paraffine base, others an asphalt base, and when first taken from the ground are called crude oil.

The refineries, by a process of distillation, take out the more volatile oils; first, gasoline; second, kerosene, and that which remains is commercially known as fuel oil. If a further distillation is made, a gas oil or distillate is taken off, and the remainder is known as heavy residuum. A fuel oil from twenty to thirty gravity, for orchard and garden heating and smudging purposes, is considered the best and cheapest.

It is a known fact that most oils, by chemical analysis, show a percentage of

sulphur and other beneficial properties, and when burned liberate them to the advantage of plant life and inimical to insect enemies of orchards and gardens.

At the convention of the American Congress of Apple Growers, held in St. Louis in 1910, the subject of orchard heating being under discussion, the fact



GEORGE C. RICHARDSON
One of the ex-presidents of the International
Apple Shippers' Association

was brought out by representative growers, who have smudged and heated orchards to control frost damage, that they considered it equal to one spraying, acting both as a fungicide and insecticide.

There is no question of doubt but that oil for heating and smudging is the most economical and effective. It can be handled with less labor, a more uniform temperature controlled, and a fire more quickly started and stopped.

The philosophy of orchard and garden heating is to create a smudge that forms a blanket or artificial cloud over the orchard and garden, that prevents the rapid radiation of heat from the ground and holds the heat generated by the burning of wood, coal or oil, and the greatest number of heat units, in the most compact form, are found in oil, and at the same time the largest volume of smoke or unconsumed carbon is thrown off. As an illustration, we cover our bodies with a blanket to retain the heat, instead of its passing off into space. The colder the weather the heavier the covering necessary. So with holding the heat over the orchard, the heavier the smoke or smudge, the easier the temperature is controlled. Whether wood, coal or oil is burned for frost prevention there will be required so many units of heat to counteract or warm up the units of cold below freezing point, to raise the temperature above the danger point. Hence, the statement that an oil pot will burn ten hours with seven quarts of oil, or a coal pot will burn four hours with ten pounds of coal—there is nothing in such a statement. The point is to be able to have the device to burn the maximum or minimum amount of fuel according to the temperature, and the economy is in being able to regulate quickly, and this ideal fuel is found in oil. Fuel oil and residuum give best results.



RICHARDSON ORCHARD OIL HEATER
Manufactured by George C. Richardson
Kansas City, Missouri

West Virginia; the Middle states have extensive pools in Ohio, Indiana and Illinois; the Western states have developed immense oil pools in Kansas and Oklahoma known as the Mid-Continent field; the Southern states have Texas and Louisiana furnishing large supplies for domestic use and export; the Pacific Coast states have the California oil fields that rank high among the oil-producing states. Besides those states named, we



FIGURE 9—THIS EQUIPMENT PROVED AMPLE PROTECTION

FROST PREVENTION IN THE ROGUE RIVER VALLEY

BY P. J. O'GARA, PATHOLOGIST IN CHARGE OF ORCHARD FRUIT DISEASE INVESTIGATIONS FOR ROGUE RIVER VALLEY, OREGON

IN THE past, various districts throughout the United States have attempted the work of frost prevention, both in deciduous and other fruits, with varying success and failure. For the most part, however, the methods employed have been such as to consider the work in the light of an experiment, rather than being practical. No doubt the citrus districts of California have carried out the most extensive experiments known; but at this time there is much difference of opinion as to their value from a practical standpoint. Firing and smudging as a protection against frost injury is by no means a new thing. California orchardists were not the first to attempt this work. Several systems, which need not be mentioned here, were employed in France more or less successfully.

It is only within the last three years that much interest has been manifested throughout the country in frost prevention through the use of fires and smudges; and this is particularly true of parts of the Middle West and the Pacific Northwest. Even at this time, very few districts are wholly prepared to fight frost in a scientific way. This is due to the fact that the best fuels and the best apparatus for carrying on the work successfully are wanting. A large number of inventions, as well as new fuels, have been put upon the market and the growers, for the most part, do not understand them well enough to get the best results. Besides, the disadvantage of not having an official of the United States Weather Bureau on the ground, or at least the inability to get accurate forecasts far enough in advance, makes the situation a difficult one.

The data which may be found in this article has been obtained in the Rogue

River Valley, in Southern Oregon, and the experimental and practical work covers a period of three years, during

Weather Bureau must always be an invaluable aid, and the very first thing a district should do is to arrange for direct



FIGURE 1—FIR CORDWOOD USED IN THE POTTER AND GOOLD ORCHARD, MEDFORD
Note how the wood is pushed into the flame. Pear crop valued at \$1,000 an acre was saved at a cost of \$4.00 an acre for firing.

which time the writer has had charge, not only in directing the actual work of firing and smudging, but also that of making the local weather forecasts in co-operation with the United States Weather Bureau. It must be understood at the outset that frost fighting can never be considered so local a problem that the work of the Weather Bureau is not to be considered. The United States

communication with the nearest district forecasting station.

It is believed by the writer as well as the growers in the Rogue River Valley, that frost fighting has been reduced to a system which may be relied upon. Through the assistance of Mr. E. A. Beals, of the Portland Weather Bureau station, and Mr. N. R. Taylor, of the Sacramento station, a system of forecasting has been worked out. This system may be improved upon, but by its use not a single error has been made during the past two years. Farmers' Bulletin 401, United States Department of Agriculture, describes the method of forecasting, and gives other valuable information. This bulletin may be obtained by writing to the division of publications, United States Department of Agriculture, Washington, D. C. Another bulletin giving the results of more recent work is now being submitted for publication and will be ready for distribution before the frost season next spring.

During the past season much valuable data has been secured, especially in the matter of orchard fuels and appliances to be used in frost prevention. In the past two years' work, wood and coal have proven entirely satisfactory, but somewhat difficult and cumbersome to handle. However, these materials have proven so satisfactory to those who have used them during the past three seasons that they seem willing to accept the difficulties occasioned by their use, and will continue using them in the future, unless some good reason may be shown for discontinuing them. Besides wood and coal, crude oil direct from the



FIGURE 2—FIR CORDWOOD USED IN THE ORCHARD OF POTTER AND GOOLD, MEDFORD
Note the method of piling the sticks, which are in four-foot lengths

California wells, and 28 degrees test distillate have been successfully used. In the past, crude oil was very little used on account of the fact that it was difficult to obtain it sufficiently free from water. However, during this season a very good grade of crude oil, practically free from water, and at a cost of about four and a half cents per gallon laid down, was very largely used in some of the large orchards with entire success. This oil was burned mostly in the Fresno pot, or heater, with about sixty to seventy pots per acre; the actual cost for one night's firing per acre, including the labor necessary to fill the pots, was about \$3. The crude oil was very easy to handle and was distributed in the orchard by means of a large wagon tank, carrying lines of hose. The hose was attached at the rear end of the tank, and the nozzles carried by the laborers. With two men for each tank, two rows of pots could be filled almost as fast as the team could walk with the loaded tank. A record of some of the work of filling the pots was carefully kept, and the average showed that six men could easily fill 2,000 pots in eight hours. At sixty pots to the acre, this crew would easily handle thirty-three acres. In handling the crude oil, as little pumping as possible should be done; gravity should be depended upon, not only in filling the pots, but also in filling the wagon tanks.

The 28 degree test distillate is a much better fuel than the crude oil, but its cost laid down is about double that of the crude oil. However, it is a fuel that can be relied upon since it can never contain water. As a matter of fact, if water were poured into it, its specific gravity would cause it to be always on top. Careful tests have shown that, gallon for gallon, it will last longer than crude oil and is not so easily extinguished. It is also easier to light since it volatilizes more readily than crude oil. However,

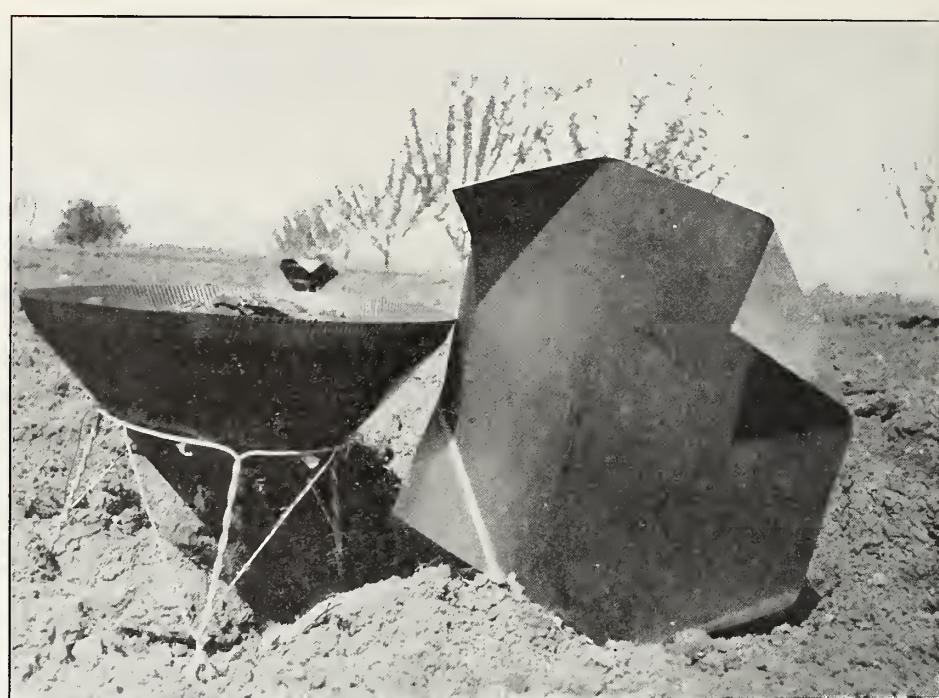


FIGURE 4—TYPE OF COAL HEATER USING TWENTY-FIVE TO THIRTY POUNDS OF COAL IN PHIPPS ORCHARD, MEDFORD, OREGON

in lighting both these fuels, gasoline should be used.

In lighting crude oil or distillate, the following very simple method has been employed by many of our orchardists. A medium-sized machinist's oil can is filled with gasoline and a few drops are squirted into each pot. A small plumber's torch is fixed to the end of a stick about two feet long, and, as the gasoline is squirted into the oil-filled pot, the lighted torch is applied immediately. By this method, fuel pots may be lighted as fast as a man can walk through the orchard.

Mention has been made of the use of wood and coal. Previous to the past

season, fine materials, such as shavings and sawdust saturated with crude oil, were used to light the coarse material. However, it has been found that the easiest way to light the wood (preferably heavy sticks, since light wood burns too rapidly), is to first place the half dozen sticks for each pile in such a way that the ends dove-tail. This method of placing the wood is shown in the accompanying illustrations, Figures 1, 2 and 3. Then a can of kerosene and a plumber's torch are used to light the wood in much the same way as the gasoline. Sometimes, instead of using a plumber's torch, a large swab, saturated with kerosene and used as a torch, served the purpose very well.

In order to light the coal, which is mined near Medford, it was found necessary to employ the coal heaters as shown in Figures 4 and 5. In using heaters, a piece of waste saturated with crude oil is first put into the bottom, and, on top of this, fine material, such as small sticks of pine or other readily ignitable stuff, is placed. Then about twenty-five to thirty pounds of broken coal is poured in. In lighting, a torch is applied at the bottom of the heater, the flame passing through the vents and igniting the waste. These heaters are lighted as rapidly as any other fire, but much more time is necessary in preparing them for use.

A large number of practical tests have been made in order to determine the length of time the different materials will burn and give the maximum amount of heat to the surrounding atmosphere. Measured gallons of crude oil and distillate, burned both in the Fresno pot and a common ten-pound lard pail holding a gallon each, were used in the tests. While there was some slight difference in different lots, or samples, the average time taken to burn a gallon of each with the covers or dampers entirely removed was about four hours. There seemed to



FIGURE 3—BRUSH AND CORDWOOD IN THE BROWN ORCHARD, MEDFORD, SEASON OF 1909
Crop of apples valued at \$1,500 an acre was saved by two firings, costing in all only \$6.00 an acre

be no difference in the style of pot so far as the time required to burn one gallon, nor in the amount of heat given off. The row of holes at the top of the Fresno pot seemed to be of no advantage whatever. The tests under actual service in the orchards showed that a plain sheet iron pot without any holes, or vents, would serve every purpose. The charge usually made for the various patent pots runs all the way from twenty to thirty-five cents or more; a pot just as good could easily be made for six to ten cents, depending upon the quality of the sheet iron.

Coal fires in sheet iron heaters filled with from twenty-five to thirty pounds of coal easily burned four to six hours, with the damper removed. Wood fires with about six good fir sticks of cord wood lasted easily four to five hours. In the burning of cord wood, or longer sticks, more attention is necessary in order to get the best results. It is quite necessary to frequently move the sticks forward into the crater of the flame, so as to keep them burning. However, knowing the direction from which the slight breeze usually comes, the wood may be so placed as to secure good results with a minimum amount of labor. By cord wood, the four-foot length is to be understood. The number of fires per acre must necessarily vary between wide limits. In an old orchard where the trees are large and mostly cover the ground, fewer fires are needed in order to maintain safe temperatures than in an orchard of young trees which only partly shade the ground. Under ordinary conditions, an old orchard with wide-spreading branches may be protected from injury, even where the temperature goes as low as twenty degrees Fahrenheit, with sixty crude oil, distillate, or coal fires, per acre. The same orchard can be protected with thirty to thirty-five wood fires per acre. Younger orchards under similar conditions of temperature, will require at least seventy pots or heat-



FIGURE 6—DISTILLATE, 28° TEST, USED IN THE MARSHALL ORCHARD
This crop was saved, while the one across the road was completely destroyed by a temperature of 26° F.

ers per acre, and, perhaps, fifty wood fires. In case temperatures do not range below twenty-six degrees Fahrenheit, the number of fires which should be lighted must be proportionately less. The conditions, of course, are so variable that no set rule can be given, and the only thing that can be said is that the one in charge must look after the temperatures in the orchard and start the fires as needed. Usually, only one-half the number of fires should be lighted, and the remaining pots or wood piles should be left as a reserve, to be lighted only when the temperature begins to fall below the danger point. It is not well to wait until the temperature has gone much below the danger point, since injury may be

done by warming up the frozen blossoms or fruits too suddenly, and thus have the same effect as the sudden warming by the morning sun. Another important factor is the placing of a double number of fires around the outside rows, especially on the side from which the slight breezes come. The cost of firing per night per acre depends not only upon the cost of the fuel, but also upon the degree of frost. Under average conditions, say with temperatures of twenty-six to twenty-seven degrees Fahrenheit, the cost per night per acre, with the fires burning four hours, has been estimated for the past season as follows: Crude oil, including the labor of distributing the oil and interest on the cost of pots, with sixty pots per acre, \$3; distillate, including the same items of expense, \$6; coal, including the same items, \$5. This is on the basis of 250 pounds of coal per acre hour, the coal being worth \$4 per ton at the mine. The cost of hauling the coal, as well as the kindling for starting it, is included within the estimate. The cost of firing with wood is very difficult to give, since the price of wood varied greatly. However, it would be safe to say that with thirty to forty fires per acre, under the above conditions, the cost would be from \$2 to \$4 per acre. From this it will be seen that crude oil is the cheapest of the fuels, taking everything into consideration; with wood a close second. Distillate is the most expensive, but for liquid fuel, it is by far the most reliable. However, when the value of the crop is considered, the above actual costs represent a very cheap insurance. The value of any fuel for frost prevention depends upon the amount of heat it is capable of giving off. All of the fuels which have been mentioned have proven entirely satisfactory. A careful test of crude oil in the Burrell orchard, at Medford, Oregon, on the night of April 13 to 14, gave the follow-



FIGURE 5—COAL HEATERS IN PHIPPS ORCHARD, MEDFORD, OREGON

ing results in a thirty-acre pear orchard, which is about twenty-two years old, the trees being large and spreading. At 12:00 midnight, the temperature in the orchard was thirty-six degrees Fahrenheit; at 1:00 a. m. the temperature dropped to thirty-one degrees Fahrenheit, when the fires were immediately lighted, and in a short time the temperature in the orchard rose to thirty-three degrees Fahrenheit. From 2:00 a. m. until 5:00 a. m. the temperature outside the orchard remained approximately twenty-six degrees Fahrenheit, while the temperature within was held at thirty-six degrees Fahrenheit; with the exception of the south side, which was not so well protected by fires, and where the temperature along the outside row registered thirty-two degrees Fahrenheit. The temperature inside the orchard was recorded by a man who had some thirty thermometers which had been previously tested at my laboratory. These thermometers were hung about three and a half to four feet from the surface of the ground, being suspended from the branches of the trees. Thermometers were also placed outside the limits of the orchard and well away from any influence of the fires within the orchard. In the above tests, sixty pots were used per acre.

Similar tests were carried out with distillate, wood and coal, and results equally satisfactory have been gotten. It is not at all difficult to raise the temperature six to ten degrees.

From what has been said it will be seen that the protection of the orchard from frost injury is dependent rather upon heating than the use of the so-called smudge. In our work we have ceased to use the term "smudge," and have substituted the word "heating" or "firing," both terms seeming more appropriate. There is only one value in a



FIGURE 8—DISTILLATE, 28° TEST, USED IN FRESNO POTS, SEVENTY TO THE ACRE, IN THE HILL ORCHARD (PEAR), MEDFORD, OREGON

dense smudge, and that is in cases where it is impossible to keep the temperature above the danger point it will serve to prevent the too sudden warming of the frozen blossoms or fruits when the morning sun strikes them. The smudge may also be more or less effective in trapping any heat generated by fires, or prevent heat from radiating away from the surface of the ground or the trees. However, when the temperature runs very low, the smudge is no protection. Some smudging has been done in the valley, using damp manure, straw and rubbish; but only in a few instances, and where the temperature did not go below

twenty-eight degrees Fahrenheit in the pear and apple orchards.

One of the most important things which the orchardist must know is when to fire. A number of manufacturers have put on the market frost alarm thermometers which may be set to ring an electric bell at any desired temperature. Most of the instruments tested by the writer have been found to be very inaccurate, and in actual use often fail to work. Several instances of failure have been reported, and in one case, a considerable amount of fruit was lost through depending upon one of these instruments. At best, all that a frost alarm thermometer can do is to give an alarm when a certain temperature is reached, and it is, therefore, much wiser to use a good alarm clock, and depend upon forecasts from the nearest United States Weather Bureau station. In each case, a good local observer is a most important factor.

In order to do accurate work and get results, all instruments used in the orchard should be tested. In my work in the Rogue River Valley I have found thermometers which varied both ways as widely as three and four degrees. All this had to be corrected, and the growers were forced to get standard instruments, or, at least, have them tested before putting them to use in the orchard. It is a wise plan to use a large number of thermometers, and one per acre is not too many. There are always some spots colder than others in every orchard, and it is only by using a sufficient number of instruments that these spots can be found.

Before any firing is done, some knowledge should be had of injurious temperatures. These temperatures vary very widely for the different fruits, as well as for the different stages of growth. A large series of tests have been made in the Rogue River Valley, and upon these tests the following table, giving injurious temperatures in bud, in blossom, in



FIGURE 7—SIXTY FRESNO POTS TO THE ACRE FOR CRUDE OIL, IN THE BURRELL PEAR ORCHARD, MEDFORD, OREGON

The temperature was raised 10°, or from 26° to 36° F., on the night of April 13-14, 1910. A crop of pears valued at \$1,000 an acre was saved, at a cost of \$3.00 an acre.

setting fruit, and at other times, is appended. Injurious temperatures may not be the same from season to season, as weather conditions previous to frosts determine very largely the ability of plants to resist freezing temperatures. In every case there should be a physiologist on the ground to determine approximately this factor. A few days of very warm weather, together with an ample supply of soil moisture, will cause the newly formed cells of the blossoms and fruit to be filled with a watery protoplasm, or cell sap, which freezes more readily than concentrated cell sap. If a freeze follows a period of weather in which temperatures have been such as to produce slow growth, lower temperatures than those given in the table may not cause injury.

TEMPERATURES INJURIOUS TO FRUIT
WHEN IN BUD, IN BLOSSOM, ETC.

	In Bud	In Blossom	In Setting	At Other
Almonds	28	30	30	28
Apples	27	29	30	25
Apricots	30	31	31	30
Cherries	29	30	30	29
Peaches	29	30	30	28
Pears	28	29	29	28
Plums	30	31	31	29
Prunes	30	31	31	29

These temperatures are approximately those of the air in contact with the fruits and blossoms. It is quite possible, however, that very delicate measurements would indicate somewhat lower temperatures, due to evaporation from the immediate surface of the plants.

The matter of forecasting frosts will not be gone into in this paper, as this has been previously published in United States Farmers' Bulletin No. 401. Suffice it to say that a fairly accurate knowledge of the weather should be known far enough in advance so that the grower may be prepared. Not only that, but he should know approximately the minimum temperature to be expected in case of a frost. It has been stated by agents and manufacturers of orchard heating apparatus that firing should always be begun when the thermometer registered thirty-



FIGURE 10—FRESNO POTS IN WINTER NELIS PEAR ORCHARD, SHOWING MANNER OF PLACING SO AS NOT TO INTERFERE WITH CULTIVATION

two degrees Fahrenheit; this is a serious mistake since the thermometer may reach thirty-two degrees many a time during the season of frosts, and go no lower. A glance at the table of injurious temperatures will show that no fruits are injured at such temperature. It is not only a waste of fuel to light fires prematurely, or when not needed, but also a very great waste of time, and time in frost fighting is the most important factor.

A most important factor in frost fighting is an efficient rural telephone system. In our work in the Rogue River Valley it is estimated that between 1,000 and

1,200 people received the forecasts daily. The forecasts were given to the Pacific Telephone and Telegraph Company at Medford, a separate sheet being given each operator. Tentative forecasts were given each morning about 9 o'clock, but the final forecast was made up at 6:30 p. m. These forecasts were then telephoned to the other towns and stations in the valley, where they were distributed locally. Not later than 7 p. m. every grower knew the probable weather conditions to be expected before morning. The forecasts also indicated the minimum temperature, as well as the time it would be necessary to begin firing. During the past two years every frost was accurately forecasted and the growers warned in ample time. The Pacific Telephone and Telegraph Company, through its manager, Mr. D. H. Drevery, as well as the operators, deserves much praise for the efficiency shown in getting the forecasts distributed. During the entire time not a single error was made.

It is believed by the writer, as well as the growers, that the Rogue River Valley has made much progress in the problem of orchard heating. The important matter of accurately forecasting frosts seems to be fairly well worked out. The writer does not attempt to say that the same methods will apply in other localities having entirely different conditions, but it is believed that they are at least worth a trial.



IT IS essential that all work connected with orchard heating be systematized so far as possible. Buy a bale of waste and always have plenty on hand. Buy a barrel of crude oil, or smudge oil; knock out the head, and after tearing waste apart put it in the barrel of oil. When thoroughly saturated run waste through an old wringer, and it is ready for use. Don't leave oil in barrel during summer; it will leak out. Have your kindling first



FIGURE 9—PRITCHARD ORCHARD, GRANTS PASS, OREGON. CRUDE OIL STORAGE TANK. The oil is allowed to run by gravity from the large hauling tank wagons into the storage tank and it is again taken from the other end by gravity for distributing in the orchard. No pumping required

sawed in six-inch lengths; it is then an easy task to split it rapidly with hatchet. Split it to size of fingers. One man can prepare enough in one day for 1,000 fires. Use egg or small lump coal; handle with coal fork having close set tines. This will separate slack, which is expensive to burn. Place waste, kindling, coal and heaters on a low truck wagon, and have men stay in wagon to fill heaters. Have brackets on side of wagon to hold heaters. To load, place small piece of waste on side of heater near bottom, throw in loosely a handful of kindling, put in the coal, using care to keep center of coal open, which will cause a quick draft when starting. Fill every other heater with full charge of coal, which will bring coal above edge of heater. The large cover protects kindling, and by placing a lump of coal on cover the wind will not blow it off. Leave every other heater lightly loaded for short firings, which is usually all that is required. Place heaters between the trees in the rows; this permits driving through to refill and do other work. Have edges of orchard reinforced with heaters, leaving fewer in proportion in center of orchard, as the pressure of the cold air on the outside forces the warm air toward the center of orchard. If work is systematized and material properly prepared, two men can handle a ten-acre orchard. Place heaters in orchard when buds begin to open, and leave until several days after date of last killing frost. Have tested thermometers at different places in the orchard and one or two outside to aid you in regulating



FIGURE 11—SMUDGING IN THE HOLLYWOOD ORCHARD, MEDFORD, OREGON, USING STRAW, MANURE AND RUBBISH

fires. All thermometers should be closely watched, as a few degrees below the frost line makes a mighty lot of difference. Don't get excited or curious to light up before the danger point is reached. Thirty degrees above zero is usual signal for starting fires. If it is midnight or before that it gets cold enough to fire, light the heaters with full charge first. If it is after midnight, light heaters partially filled. Use an asbestos torch. A boy can light an acre in five minutes.

been picked from its limbs since it came into bearing the spring of 1871.

The tree was grown without irrigation from a seedling planted by Cantrel R. Frazer in 1866, two years after he settled in the valley. It is forty-two feet in height and its branches spread fifty-seven feet from tip to tip. This is shown by the positions of the two men at the sides of the accompanying photograph, taken a few months ago, when the branches were laden with pink and white blossoms.

The trunk is seven feet in circumference at the base and measures six feet six inches just below the first limb, which is four feet from the ground and measures four feet seven inches. Mr. Frazer, who planted the seedling, is standing at the trunk of the tree. The tree is sound and healthy, despite the fact that it has produced fruit every season for nearly forty years.

Professor W. S. Thornber, horticulturist of the Washington State College; J. A. Balmer, former state horticultural commissioner of Washington, and R. A. Jones, a practical orchardist of Spokane County, composing the nomenclature committee of the Washington State Horticultural Association, have sent the following report to that organization in naming and describing the Frazer tree:

"We submit the name of *Coppepii* and the following description: The fruit is medium to large, roundish, oblate, irregular and slightly ribbed. The cavity is deep, broad, russeted and slightly wavy. The stem is short and heavy. The basin is narrow, abrupt, deep and wavy. The calyx is half open to closed.

"The color is yellowish green, faintly mottled with reddish purple on sunny side; dots are large, irregular, green and russeted. The flesh is yellowish white, mellow, juicy, coarse-grained, of a mild sub-acid to sweet flavor, and of fair quality.

"The cup is conical; stamens, medium; core, large; closed seeds, few, dark brown and plump. The season is early to medium winter."

TREMENDOUS YIELD OF APPLES FROM ONE TREE

BY AUGUST WOLF, SPOKANE, WASHINGTON

EXPERIENCED growers predict that the Frazer apple tree, growing in the Walla Walla Valley, near Walla Walla, Washington, southwest of Spokane, will yield between 150 and 200 bushels of fruit this season, thus breaking

its record of 126½ boxes in 1907, the highest production from a single tree known anywhere in the world. The tree bore seventy boxes in 1906, forty-two boxes in 1908, and forty-five boxes in 1909. More than 500 barrels of fruit have



THE FRAZER APPLE TREE IN EASTERN WASHINGTON

ORCHARD HEATING IN GRAND VALLEY, COLORADO

BY LEWIS MEYER, PALISADE, COLORADO

FROM the heat of the battle which the ranchers of the Grand Valley fought and won with the frost king, when he swept the entire country—East, West, North and South—on the night of April 16, comes a number of important lessons vital to the fruit growers of the world.

First was demonstrated the success of the smudge pot, or orchard heater, as a profitable protection against freezing temperatures.

Second, that smudging, to be a success, must be carried on in a practical, business-like and systematic manner.

Third, that while it is simple enough to maintain an even temperature above the danger point in an orchard, it is exceedingly difficult to raise the mercury in the thermometer to any appreciable extent once it begins to fall rapidly in the tube.

In other words, while smudge pots are proven to be scientifically sound as an insurance against a freeze, with the mercury dropping as low as seventeen above in isolated spots, it is essential that intelligence, system and hard work be combined to get the results which the manufacturers and inventors have claimed for them.

The man who lighted his pots and then went to bed, lost his crop in the Grand Valley during the April freeze, just as well as the man who hadn't the forethought to provide this modern protection for his trees. Also, there was a small per cent—possibly five out of every one hundred ranchers who suffered partial or total losses because they didn't smudge properly, or permitted their fires to burn low, and, when the critical period of the morning arrived they were unprepared to cope with the rapidly falling temperature.

In the closing days of the winter campaign which the orchard heater manufacturers waged in the valley, there was

a pretty battle between the men who were selling oil pots and the agents for the coal heaters. After the successful fight against the freeze of the sixteenth, when scores of men mistakenly feared

course, that oil is more expensive, and it is also agreed that oil will make a quicker heat, although there are differences as to whether it is more intense than a coal fire. Some of the orchard-



GENERAL VIEW OF P. GROOME'S ORCHARD, DELTA, COLORADO
Crop saved by coal orchard heaters

that they had been frozen out, the old contention was renewed. The oil men claimed that they alone had saved full crops, while the coal men as stoutly maintained that they had the only successful weapon with which to ward off a freeze.

It is true, and the advocates of both methods of heating will admit it now, that both coal and oil insured hundred per cent crops, while in some cases neither was entirely effective. So, until the question is scientifically decided to the satisfaction of the layman, it must still be left open.

It is admitted from the outset, of

ists in fact, are preparing now to use both the oil and coal, lighting the coal pots in an ordinary freeze and holding the petroleum by-product as a reserve battery in case there arises a sudden need for additional and more intense heat.

There were perhaps more than a dozen varieties of pots used in Mesa County orchards during the three or four nights of April when the mercury dropped to an alarming degree. Some ranchers saved their orchards with cheap pots of home manufacture, while others were unsuccessful, even though they used the most expensive heaters offered for sale.

So it would appear that the success or failure of the fruit crops of the nation does not depend upon the instrument so much as upon the man who is using it. Some orchardists, of course, were improperly equipped at the outset—they did not accept the advice of experts, who had made tests, and had an insufficient number of pots to the acre.

The orchard heaters passed their severest tests this April. Last year the use of the little pots was more or less an experiment, and not a fully demonstrated one at that. In 1909, while practically all the men who smudged saved their crops, there were hundreds also who had just as big crops, who did not use orchard heaters at all. I talked to one or two men who, although they used the pots a year ago, decided that they were a failure, and who consequently did not attempt to make use of them this year. One man claimed that he had just as large a crop on five acres he neglected to smudge a year ago as on the five he had heated. Still another rancher declared that, figuring the cost of the fuel, pots and labor, the harvest on the



ORCHARD OF P. GROOME, DELTA, COLORADO
One night's smudging saved the buds. Has now more apples than it can bear without thinning.
Coal heaters used.

smudged section of his orchard did not exceed that of the unsmudged part sufficiently to pay the actual expense of the heating.

But this year the lines have been more sharply defined. The doubting Thomases in the Grand Valley have all been convinced. Of the men who did not smudge—possibly twenty-five per cent of the total—not more than five per cent can boast of a full crop. And in nearly every case where the man who failed to smudge boasts of a crop, it has been found that he simply profited from the heat generated by some irate neighbor whose orchard lay to windward.

While the system of orchard protection from frost is far from having reached perfection, experience of this spring has taught the ranchers of the nation many valuable lessons. Chief of all which the Grand Valley learned is that the use of smudge pots—"heating all out-doors"—as has been said, is eminently practical. The scoffers who first claimed that orchard heating was more expensive than the profits from the fruit saved have been silenced. One rancher who saved his entire crop of apples and finds it necessary to thin, told me that it cost him six dollars an acre to insure his fruit, smudging three nights. This, of course, did not count in the original cost of the pots. It is probably considerably less than the average expense over the valley. Oil is more expensive. It costs six cents per gallon delivered at Grand Junction this year, which is an increase of one cent per gallon. In the Grand Valley coal can be had at a slight cost, the ranchers being in a position to haul direct from the mines. Oil is much easier to handle—it takes less labor when labor is hard to get—the pots can be started quicker and the fire burns longer and at a more even temperature. The oil men claim that by use of the regular pan, and taking the labor question into consideration, their pots are just as economically operated.



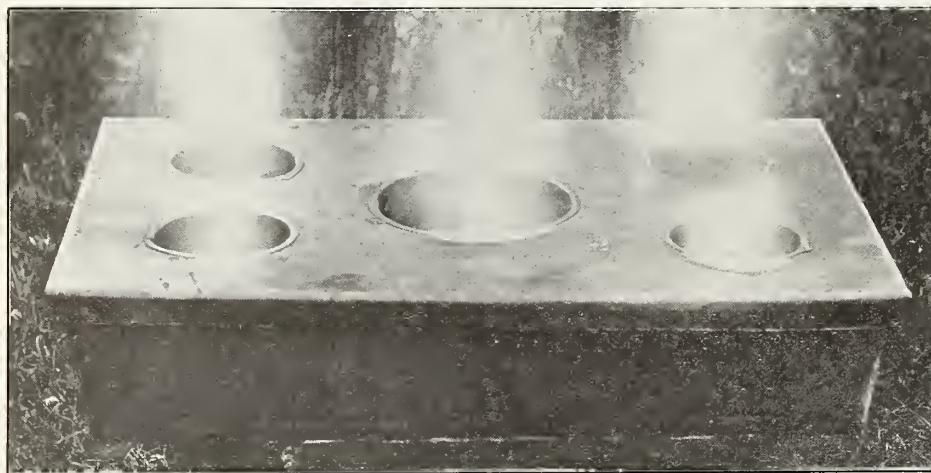
THE OLSON ORCHARD COAL HEATER IN ACTION IN THE GRAND VALLEY, COLORADO
Manufactured by The Colorado Fruit and Commercial Company, Grand Junction, Colorado

But, whatever sort of fuel used, it can readily be seen that the cost of insurance is trifling when compared with the value of the crop saved. In the Grand Valley the ranchers figure that he has had a bad year if his returns run as low as \$200 per acre. This year, by reason of the general destruction of the fruit crop of the nation, the ranchers who smudged will be paid ten times over the cost of the insurance by the increase in prices in consequence of the shortage.

The most vital lesson taught by the April freeze is the necessity of starting the pots in plenty of time and maintaining an even heat—not permitting the

temperature to drop in the heated area for an instant. Local authorities differ as to when the fruit buds are in danger from a hard freeze, and how much cold they can stand without damage. It is safely asserted, however, that when the pink is beginning to show it is well to be prepared to light up when the mercury registers at thirty. Thirty will not cause an injury to the buds, but there is always a danger of the temperature dropping still further, and, although with the buds still well covered, only the weaker ones would be killed, it is, perhaps, just as well not to take the chance of loss. I have talked to a score of fruit growers, some of whom lost their crops and many who did not, and they all agree that the principal loss was due to the failure to light their pots until the mercury had dropped to such a degree that it was impossible to force it up again. With the mercury going steadily lower, these orchardists were unanimous in their opinion that it is useless to attempt to stem the tide and recover lost ground. Some of them did succeed in raising the temperature four or five degrees, but not where they had waited too long before firing the pots. Where the temperature was kept around twenty-nine and thirty all night, and the fire stirred at the critical period before dawn, the heat was maintained within one or two degrees beyond the danger line, even with the mercury at fourteen to fifteen outside the heated zone. In some cases where coal pots were used, briquettes were thrown on the fires when the thermometer registered the alarm, and buds and blossoms passed safely through the critical period.

Some orchardists made the mistake of beginning the fight without proper preparation. The telephone company



Next season will see a new type of orchard heater tested out in Grand Valley orchards. This is a gas-burning device, the invention of A. D. Ward, a Clifton, Colorado, rancher, who has been experimenting with smudge pots for several years. Tests of the pot which have been made by various experts demonstrate that the heater will burn continuously for thirty-six hours without refilling, which is quite a consideration during muddy seasons, when it is impossible to get into an orchard. The heater is shaped like a square bread pan and has somewhat the appearance of the ordinary camp stove. It is built to hold ten gallons, five gallons and three gallons, and with one, three and five openings for the fire. The gas-burning apparatus is in a double cover, perforations permitting the consumption of gas, oil, smoke and oxygen. In the double cover are set individual bottomless, circular pots, which will all burn at one time or which can be lighted as needed. Another advantage claimed for this pot is in the fact that the flame burns low, avoiding the possible scorching of the trees, while the consumption of smoke eliminates the danger of depositing soot on the trees.

co-operated with the ranchers and the Weather Bureau by sending out hourly reports when the forecast was portent with danger, but many ranchers failed to avail themselves of the opportunity thus offered. Others were poorly supplied with thermometers and relied on one or two unreliable instruments, although they were shown how they might be tested as to accuracy. Instead of having half a dozen good instruments at various points in the orchard, and a few outside, they relied upon one or two poor instruments within the heated zone. Thus, when the mercury began dropping rapidly on the outside, giving warning of the necessity for lighting every pot in the orchard, the rancher keeping guard only under his trees failed to get the danger signal until he read it on his own thermometer within, when it was too late to build up his fires or start the reserve pots.

The greatest loss was suffered, however, by the rancher who was insufficiently supplied with pots. Not one of the manufacturers recommended less than fifty pots to the acre, ranging from that number up to one hundred, while many of the ranchers used much less than the minimum recommended. As a general thing, it might be said, that every man who followed the instructions of the manufacturer saved his crop.

In all probability, next year will see this minimum increased. By installing a reserve force of pots, to be lighted in an emergency, it will be possible to cope with almost any sort of freeze. One of the Palisade ranchers, who realized the danger to his crop at the same time that



CRYSTAL SPRING FARM, C. E. MINCER, MANAGER, HAMBURG, IOWA
Picture taken during the time of the freeze last spring. Oil pots used. The photograph was taken in the morning, when the temperature outside of the orchard was 24 degrees and everything covered with heavy killing frost. Inside orchard temperature was 33 to 36 degrees, and leaves were wet with dew. The entire crop was saved.

he discovered he only had half enough pots, abandoned one-half the orchard and saved the remainder by moving all the little heaters on to the part for which he had decided to make a fight.

Still another point to be considered is the necessity for system in fighting a freeze. He would be considered rather a poor sort of fire chief who, on the first alarm, was unable to lay his hands on sufficient hose, or was unable to locate

the hydrants. Yet there were orchardists who, when the danger signal sounded, were half prepared and were unable to find the pots, enveloped by the dense smoke, even with the use of lanterns, and who lost their crops by running aimlessly about their orchards, when a systematic effort, planned beforehand, would have saved them.

By properly placing the pots in the orchard, in straight lines, if possible, with the wick or waste to be lighted all on the same side, and then providing fuel likely to be needed for replenishing, in convenient places among the trees, much valuable time can be saved. The men who made smudging a business had a plan of campaign carefully thought out in advance—each helper had been assigned a part, and when the tocsin sounded every man knew his duties. The astute general still has a valuable crop, while the haphazard rancher, who smudged simply because he had been told it was inexpensive and might be a good thing, is mourning his loss and planning differently for the future.

The important lesson is that the fruit grower has finally demonstrated by actual practice, that he can successfully cope with the forces of nature—that frost, the one danger which has always threatened the industry, can be prevented from exacting its usual toll and that even a heavy freeze, such as destroyed fifty millions in fruit, cotton, grain and other agricultural products, can be so neutralized as to insure practically full crops every year.

The pioneer fruit growers of the Grand Valley have learned their lesson in the loss of millions in the past, and now the tillers of the soil of the entire nation may reap the benefits of their costly experiences. The twenty-five hundred carloads of fruit which will be shipped this fall from Mesa County will stand as a monument to the foresight of the men who originated this gigantic system of crop protection.



GRAPHIC STORY OF FROST FIGHTING IN COLORADO

BY ROBERT H. RHODES, OF PALISADE

OUR orchards blossom very early in the season here in the Grand Valley, and peaches especially have a foolish way of blooming before the leaves come out to protect the tender blossoms; usually they are in full bloom by the last days of March, while their leaves do not come for some twenty or thirty days.

In the meantime, old, hard-hearted winter, angered at having to give up his post, usually returns for a day now and then to torment his gentle successor. Now, this is the time of year when we use our orchard heaters, and, by the way, they have long since passed the experimental stage with us. They have come to stay, and we consider them just as important as the spraying machine, or even more so.

Any old smudge pot under a heavy foliage looks good for a short time against one or two degrees of frost, but the heater I am going to tell you of is the only one I know of in existence today that will raise the temperature from ten to fifteen degrees in naked Elberta peach trees in full bloom, and keep it up from 7:30 o'clock in the evening until sunrise next morning. This is no "hot air" talk, but straight facts, and we have the facts to prove them.

We do not claim to know all about orchard heating, but we do know that it has cost us lots of time, labor and experimenting with different heaters, and a beautiful crop of high-priced Elberta peaches, for what we did not know, and, therefore, I feel that our words should carry some weight.

From my own experience this season, and the experience of others who used these heaters last spring, we do not see how any fruit grower can afford to be

without them, regardless of where his orchard is located.

In Palisade we thought our orchards were immune from frosts because we had raised seventeen crops of peaches

We heated our orchards five different nights this spring, with the result that we have a full crop—one that will pay for all the smudging we shall have to do the rest of our lives.



MR. J. L. HAMILTON LIGHTING THE HAMILTON RESERVOIR ORCHARD OIL HEATER
Manufactured by Hamilton Reservoir Orchard Heater Company, Grand Junction, Colorado
Photograph Copyrighted, 1909, by F. E. Dean, Grand Junction, Colorado

without a failure, but when the frost came it did its work quickly and thoroughly for two successive years, and then the most of us got "wise."

Does orchard heating pay? And is it a success? Ask our neighbors just over the fence, who were "from Missouri."

We fired the first time this spring on the night of March 30, and were not entirely out of danger of frost until the middle of May.

We fired the night of April 14. Having oil heaters, the two of us were able to re-charge them on our ten-acre tract by 10 a. m. of April 15; shortly thereafter, I retired for a little rest and sleep, feeling that the weather would moderate as the day advanced, but upon arising at 5:30 p. m. I at once discovered that my hopes were doomed to disappointment.

Great fleecy clouds were hurrying up from the northwest, chased by a bitter wind that must have been intended for January rather than April.

I walked to the postoffice at Palisade for the day's mail, and in every window was the Government weather forecast: "Freezing temperature tonight." I returned home and sat down to the evening meal with a feeling of gloom and unrest, and my wife, noticing this said, "Cheer up, your orchard is protected by good heaters; what do you care how cold it gets?" "Yes, thank God," I said, thinking as I said it of just one year ago, when I lost a beautiful crop of high-priced Elberta peaches with a full compliment of coal pots.

By 7:00 o'clock I noticed the Government thermometer and it stood at thirty-seven, or rather it did not stand, for the temperature was falling fast. At 7:30 I called up the Weather Bureau for "consolation" and received it in this reply: "It is bitter cold all over the county and temperatures here are already down to twenty-seven in many parts of the



OLD FENCE RAILS USED FOR FIRING, SUCCESSFUL IN SAVING BARTLETT PEAR CROP OF J. G. GORE, IN ROGUE RIVER VALLEY, OREGON

From U. S. Dept. of Agriculture Farmers' Bulletin 401

valley. Special message from Denver says, 'Temperature will drop to twenty degrees on Western Slope of Colorado tonight; you had just as well light up now, for it is going to be an all-night's fight, and a hard one."

I did not dispute what our good friend in the office of the United States Weather Bureau said regarding the fact that we would have a wicked night, but I did not accept his advice as to lighting up at once. As I hung up the telephone receiver I said to myself: "The coal pot men and the little oil pot men may begin firing at thirty-six or thirty-seven, but not so with a large oil heater, and especially of the regulated type."

We examined our torches, filled our automatic gasoline cans and made ready for the struggle which we saw was inevitable.

At 7:45 the temperature had fallen to thirty-two and the whistles shrieked loud and long, warning the ranchers that a traitor was in camp and that our remorseless and relentless enemy, Old King Frost, with his horde of icy-fingered warriors, was advancing on our orchards. Still we did not fire—saving our energy and our ammunition until we could "see the white of our enemy's eyes," while others were wasting theirs getting into action.

Outside, all was confusion and hurry, farm wagons laden with coal rattled past in the darkness on their way into the orchards, the shouts of men and the ring of coal shovels could be heard as men fought desperately to save their crops with pots that were impracticable and unsafe.

Already they were firing heavily to the west of us, the smoke boiling up above the orchards into the clear, calm sky and the light and heat from the heaters below banking against it in colors of deepest crimson and rarest gold.



THE TROUTMAN ORCHARD OIL HEATER IN ACTION
Made by The Round Crest Orchard Heater Company, Canyon City, Colorado
Photograph Copyrighted by F. E. Dean, Grand Junction, Colorado

At 9:00 o'clock the temperature dropped to thirty degrees, and instantly we rushed for our orchards; torch and lighter in hand, we drew the cover, dashed on the gasoline, passed the torch over the opening, and on to the next heater. As we rushed up the slope on the windward side of our orchard we left a trail of flame and smoke behind us, and in fifteen minutes the four of us had our orchard in a sea of flame, under a cloud of smoke, with heat striking us full in the face, no matter which way we turned.

As we lighted the last heater one of the boys jokingly remarked, "If old Jack Frost should get in here he would be so bewildered that he would not know where to look for a bloom," and how true—he would have been singed to a finish should he come from any direction.

We entered the packing house and sat down for a few moments to await the effect the heaters would have on the temperature before taking another reading.

At 9:35 we took the outside reading, which was twenty-eight degrees. Going into the orchard we found we were carrying a temperature of thirty-seven degrees. Knowing we had a heater that we could instantly adjust and that it was foolish to consume fuel for nine or ten degrees of frost when we had but four, we retraced our steps over the orchard and closed them down to the required amount, and by comparing readings again, found the outside temperature at twenty-seven and a half degrees and the inside at thirty-three degrees.

We then went into the house and sat down by the fire and chatted, smoked, read and napped, always leaving one on watch to take the readings of the thermometer every fifteen or twenty minutes.

At 11:15, as I was doing this, a neighbor came tramping through the orchard, accompanied by his faithful dog. He hailed me with, "Say, while my heaters seem much hotter than yours, my orchard appears to be colder. Why is it?" I asked him if he was not using coal, and if it had not burned sufficiently to almost cease sending off any smoke, to which he replied, "yes." Then I explained to him that to heat an orchard without smoke was like heating a house without a roof; to this he thoughtfully agreed. Later, I asked him to come inside and rest, but he answered that,



THE OLSEN ORCHARD COAL HEATER READY FOR USE
Manufactured by The Colorado Fruit and Commercial Company, Grand Junction

tired as he was, he must return and begin re-filling his pots.

As he trudged away through the trees and smoke into the night, tired, worn out, with bent shoulders and aching breast, my heart went out to him, for he was old enough to be my father, and was returning to an all-night's toil with shovel and poker.

Just after we had finished eating our lunch the whistles again wailed out their doleful warning upon the midnight air, announcing that the temperature was falling still lower. The din and confusion in the distance began anew; men urged their coal pots on by trying desperately to poke the ashes from them, by adding fresh fuel, etc.

The little oil pots were refilled as best they could be in the night, but, taxed to their capacity, what more could they do? I am told of an incident wherein one owner, becoming desperate at not

being able to raise the temperature the required amount, commanded his men to fill them to overflowing, thereby gaining a larger flame from the oil on the outside of the pot and upon the ground. But all this nerve-racking confusion, danger and labor was eliminated with our large-capacity regulated heaters.

When we saw the outside thermometer drop to twenty-four degrees and the inside one reach thirty degrees, we quickly drew the covers, and soon our inside reading shot up to thirty-two and thirty-three. This required but a few moments of time on the entire ten acres, and we then returned to the house and the boys lay down for a little rest and sleep, to be called again if needed. I remained on watch, and, having nothing else to do, passed the time in reading and smoking. As I sat by the fire reading "With Teddy in Africa," or "Little Ben's" masterpiece, "The Beast and the

Jungle," and peered through the window at the heaters in action, driving away eight degrees of frost from my tender Elberta blooms, with ten more degrees of heat back of the regulator to be brought out instantly if the occasion demanded it, I breathed a prayer of gratitude for this wonderful invention, which, if adopted generally, will be the saving of more dollars to the fruit growers of America than the pruning shears or the power sprayer.

As morning approached and dawn spread her great white wings across the heavens, I went forth, to find the little foot bridge near our orchard coated over with frost as white as snow, ice in the water trough nearly an inch thick, and so fierce was the onslaught of Old King Frost and his silent-fingered scavengers that alfalfa nearly ten inches high lay limp and dead on the ground not ten paces from the "firing line." Yet, after two weeks had passed, not a peach, sweet cherry, apricot, apple or pear bloom in the orchard did we find injured in the least.

As dawn broadened into day I called the boys, and just as the sun lifted his smiling countenance over the mountains and threw his first shaft of gold into the tree tops, we quickly shut off the heaters, thereby instantly stopping all fuel consumption, and gallantly responded to the hired girl's whistle for breakfast.

The task of recharging the heaters for another all-night's burn was soon disposed of, and then for a rest, to dream sweet dreams—none, however, more pleasant than the recollection of the previous night's successful fight against old Jack Frost.



AN APPLE FAIR will be held at Albany, Oregon, November 9, 10, and 11, and the premium list has been prepared. A splendid display of fruit is promised and the indications now are that the showing will be the most complete and the fair the best ever held in the Willamette Valley, as the orchards thereabouts will contribute apples of fine quality as can be found anywhere. At a meeting of the Apple Fair Board details were perfected for the coming show, and the following premium list arranged:

Class A—Linn County barrel, grand prize, best county exhibit, \$50 cash and \$100 cup by Linn County; second prize, \$50; third prize, \$30 cash.

Class B—Club or community exhibits, Linn County only, best ten-box exhibit, three or more varieties, prizes to be announced later.

Class C—Free for all, best five-box exhibit, three or more varieties; first, \$30 cash; second, \$15 cash; third, \$5 cash.

Class D—First and second prizes of \$5 and \$2 will be given for the best single box exhibits as follows: No. 1, Yellow Newtown Pippins; No. 2, Spitzenergs; No. 3, King; No. 4, Baldwin; No. 5, Red Cheek Pippin; No. 6, Ben Davis; No. 7, Grimes Golden; No. 8, Jonathan; No. 9, Wagner; No. 10, Stark; No. 11, Mammoth Black Twig; No. 12, Gano; No. 13, Northern Spy; No. 14, Rome Beauty.

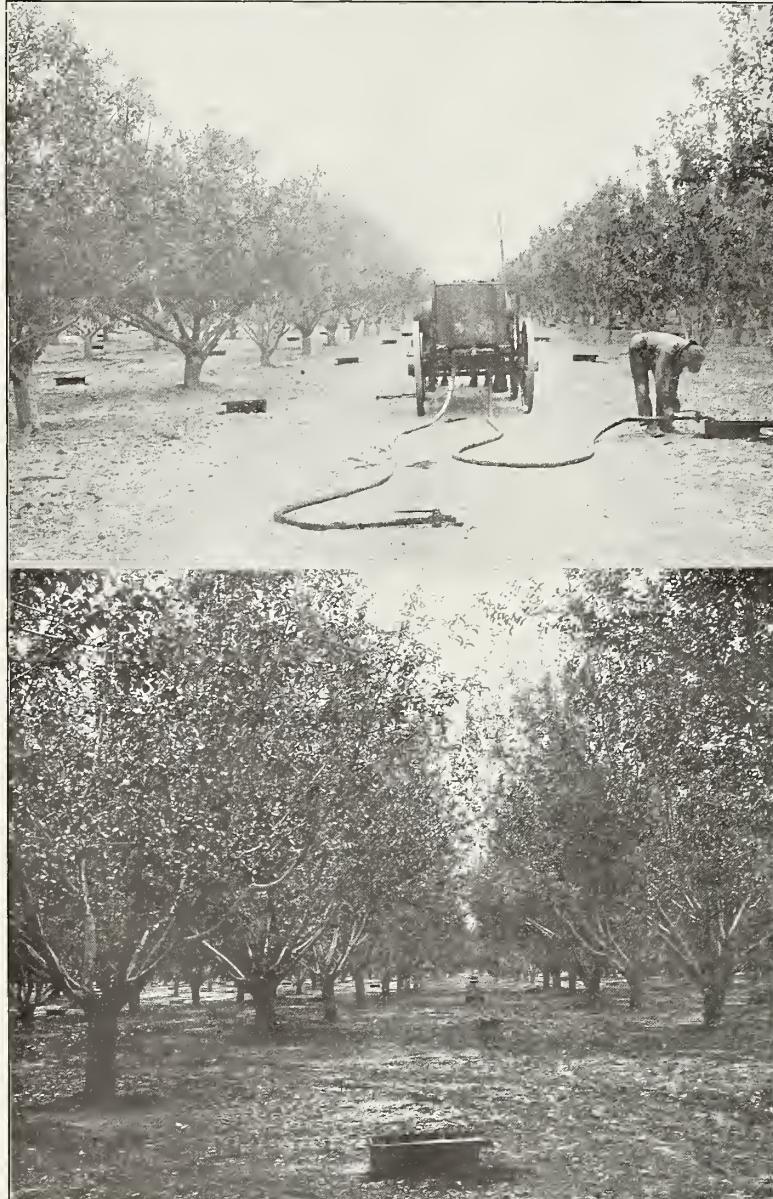
Class E—Best commercial packed box, \$10 cash.

Class F—Plate Exhibit, ten or more varieties, first, \$5; second, \$2.

Class G—Special premium exhibit, to be announced later. The committee is now engaged in arranging the prizes for this class.

The Apple Fair for the year 1910 will be in charge of the following men, and their past experience with affairs of this kind insures its success: Chairman, C. H. Stewart, in charge of all the arrangements; secretary-treasurer, F. M. French; finance, F. M. French, W. A. Eastburn, H. Bryant; building and decorations, J. C. Holbrook, F. J. Fletcher, J. A. Howard; premiums and advertising, D. W. Rumbaugh, S. A. Lasselle, C. H. Stewart; program speakers, H. H. Hewitt, E. L. Jones, George H. Crowell; exhibits, J. M. Hawkins, C. H. Stewart, F. M. French, J. A. Howard, W. A. Eastburn.

The place for holding the fair has not been chosen, but it is expected that the visitors will again be entertained in the big gymnasium of the Aeo Club.



LOWER PHOTOGRAPH—THE HAMILTON RESERVOIR HEATER READY TO USE
UPPER PHOTOGRAPH—REFILLING THE HEATERS

By courtesy of Colorado Agricultural College, Fort Collins, Colorado

PREVENTION OF FROST INJURY TO FRUIT CROPS

BY G. B. BRACKET, POMOLOGIST, BUREAU OF PLANT INDUSTRY

THE fruit grower, from time immemorial, has been at the mercy of the elements. Frost is one of the most formidable foes with which he has to contend. Millions of dollars are lost annually by silent, relentless frosts that come either when the trees are in blossom or just after the fruit has set.

Recent demonstrations in the fruit district of the Middle West have proved beyond a peradventure that damage to fruit trees by frost can be controlled to a greater or less extent. One of the fundamental principles that underlie successful frost fighting is a knowledge of the subject of air drainage. Cold air, like water, settles to the lowest ground, and anything that will break up this stratum of cold air and cause it to mix with the upper strata of warm air will prove of great value in combating frost injury.

Frost injury to fruit trees most frequently occurs when there is a clear, still, dry atmosphere, and when the radiation is uninterrupted by clouds or moisture, and the cold air settles in poorly air-drained areas.

While frosts may not be severe, they are often just severe enough to damage the blossoms and tender fruits, and they not only reduce a crop of fruit one-third to one-half of what it should be, but sometimes destroy the entire crop for one year or for several successive years.

In order to overcome destructive atmospheric conditions three original methods have been tried: (1) Explosives, (2) smudges, (3) heating devices.

Explosives were first used in the vineyard districts of Austria, France, and Italy, where hailstorms and frost were prevalent and were destructive to the grape crop.

Many years ago, Mr. Albert Stiger, burgomaster, Windisch-Briestrts (Lower Steirmark, Austria), we are informed,

owned extensive vineyards on the lower slopes of the Bacher Mountains, a locality persistently visited by destructive hailstorms. He decided to drive the clouds away by the use of explosives and established six stations on six of the surrounding mountains, a locality two miles in extent. The stations, built of wood, sheltered ten heavy mortars each, and near each station was a cabin in which was stored a supply of powder. A corps of volunteers consisting of neighbors and owners of small vineyards was trained to proceed to the stations and handle the mortars whenever

there was the slightest indication of an approaching storm. Each mortar was loaded with about four and a half ounces of powder; the firing was simultaneous and continuous until the clouds were either scattered or blown away. This also had a tendency to break up the stratum of cold air and prevent its settling in the low grounds. These experiments were practiced for some time and are said to have been successful.

The damage to fruit buds by frost is more severe when the sun's rays, following a night of cold, are allowed to fall on the trees. To prevent this sudden change from freezing to thawing the system of smudging was adopted.

After many series of experiments it is said that Mr. Bellot des Minieres recommended the accumulation at various points in the orchard or vineyard of combustible matter capable of producing a thick, black smoke. He believed that if heaps of fuel were set on fire at sunrise the resultant smoke would make a thick, black, impenetrable veil that would protect the vines from the sun's rays and would maintain a general temperature in the vineyard at a point that would counteract the effects of frost. The purpose of this method is to prevent the radiation of heat from the earth's surface and to shield the fruit buds from the sun's rays by creating a cloud of smoke over the area to be protected.

Consul D. I. Murphy, of Bordeaux, France, 1908, reports a device invented by Mr. Edouard Lestout, of that city, for making artificial clouds for the protection of vineyards. Small wooden boxes, open at the top, were filled with an inflammable compound consisting of equal parts of resinous and earthy substances, such as clay and the like, reduced to fine powder and pressed into a com-

pact mass. In the center of each box a wick extended through the mass and served to ignite it; or the wick could be dispensed with and the compound



PLATE 2—APPLE ORCHARD EQUIPPED WITH TROUTMAN OIL HEATERS

gnited by pouring over it a few drops of kerosene or alcohol and lighting it with a match. The boxes were made of pine wood and were eight inches long by six inches wide, and were placed thirty feet apart in the vineyard. The most dangerous frost period for grapes was found to be in April, when the young shoots were showing vigor and the sap was flowing freely. Mr. Lestout found

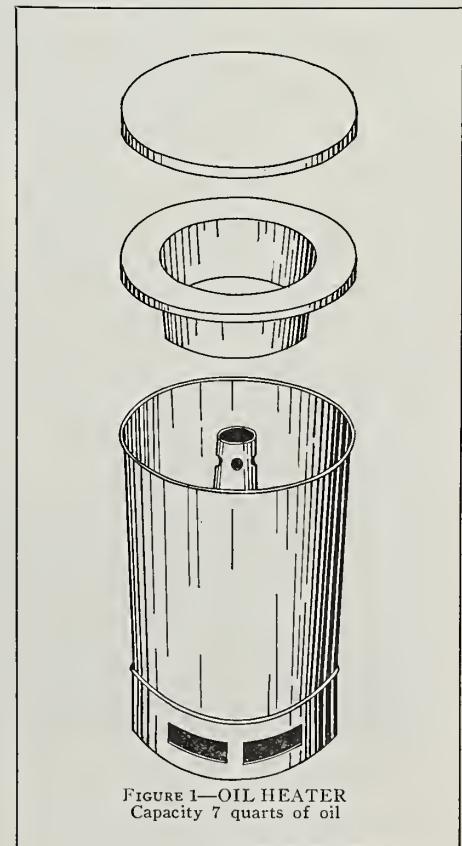


FIGURE 1—OIL HEATER
Capacity 7 quarts of oil



TROUTMAN OIL HEATER
Manufactured by The Round
Crest Orchard Heater Company
Canyon City, Colorado

little danger from a dark or cloudy morning that followed a cold night, but the danger occurred on the clear mornings when the sun's rays shone directly on the unprotected plants. This invention probably led to the use of the smudging devices so extensively used subsequently in California.

Vapor smudge, as first used, is accredited to Meacham. Small areas were covered with wet straw, manure, and cypress brush; this material was burned in quantities and evaporating pans were constructed which were calculated to have a sufficient capacity for furnishing enough vapor to cover the areas owned by the individual operator. It is said that eminent engineers made estimates for such work, but they miscalculated the absorptive power of large, adjacent dry-air bodies, and the vapor, as fast as generated, disappeared into space. They evidently failed to note the fact that they began their work in the valleys at the lowest stratum of cold air, and that to be effective the vapor-producing heat should have been radiated from the areas above the valley.

This method had also the weak point of necessitating the co-operation of every land owner in the valley. It had to be accomplished on a wholesale scale to be effective, for no individual could cope single handed with the elements.

In early days, pioneer lemon growers in California located their groves in the valleys, with no thought of the law governing the gravitation of cold air, and their efforts resulted in almost complete failure. The cold air from the snow-capped mountains flowed down to the lowest ground whenever there was no wind to keep up the circulation. This mistake was soon discovered and subsequently plantings were made upon higher plateaus.

Edward Copley is credited with inventing the heating device consisting of wire baskets and a machine to manufacture them cheaply. The baskets were filled with kindling and about twenty-five



OLD RAILS USED FOR FIRING TO SAVE THE CROP OF THE SEVEN-YEAR-OLD APPLE ORCHARD OF J. G. GORE, IN ROGUE RIVER VALLEY, OREGON

From U. S. Department of Agriculture Farmers' Bulletin 401

pounds of coal. They were then scattered about the orchard, about twenty-five to the acre, suspended by wires to limbs of trees and by iron rods to limbs in budded orchards. This system accomplished what it was intended to do, but coal is heavy to handle and sometimes difficult to ignite, especially after a rain.

Later a firm in Los Angeles manufactured and sold a briquet; this was made after the style of the briquets used in Germany. It consisted of a tube composed of sawdust, oil-refinery refuse, and low-grade oil pressed into shape and used with or without a wick. A modification of the method was later made by introducing cheap sheet-iron stoves, properly dampered, and in which the briquet material was made to burn without compression. The material to be burned was shipped in sacks to the grower. This form of heat did the work of successful frost fighting, but had the

disadvantage of being bulky, and the labor of handling both stoves and material was rather excessive and costly. The sheet-iron stove has undergone various modifications and there are patented devices of it made by persons in California, Colorado, and elsewhere.

In orchard heating the fuel to be depended upon must be easy to light, a fuel that will burn a long time and that will give out a great amount of heat; it must also be easily controlled in regard to temperature. Oil, in some form, doubtless best meets these requirements, but where oil is scarce and coal abundant, the latter would be the cheaper fuel.

The oil heater, so far as we know, was first manufactured by a firm in Fresno, California. Since then several styles of oil heaters have been manufactured and put on the market. One of these well-known and extensively used orchard oil heaters, constructed on scientific principles, has a center draft tube that feeds oil to the flames, promotes combustion, and makes good use of the oil. The heater holds about five quarts of oil, will burn six or seven hours, is made of 28-gauge iron, and weighs, with cover, one and three-fourths pounds. It stands eleven inches high. The heaters nest nicely, fitting one into the other, for shipping purposes. The cover is made to fit like a lard pail lid, and is raised in the center so as to shed water. This heater has successfully stood the test of several years. It is successful because based on the principle that there is no need for great heat locally, but for numerous small fires, well distributed. The small fires do not necessarily change the direction of the air draft, the object being to warm up the draft as it is pressed down from above by the settling of the colder air, and thus avoid the forming of cold spots or pools. Above the danger point the upper air strata are warmer, and usually a few degrees of rise in temperature is all that is necessary for safety.

An oil heater that will hold seven quarts of oil and burn ten hours



ARRANGEMENT OF CORDWOOD IN THE ESOPUS ORCHARD OF W. H. BROWN IN ROGUE RIVER VALLEY, OREGON

From U. S. Department of Agriculture Farmers' Bulletin 401

(Figure 1) is so arranged that the heat may be increased or diminished at will. There are larger heaters that hold six gallons of oil and burn thirty-five hours, but the medium size is deemed best for all practical purposes. An apple orchard equipped with oil heaters is shown in figure 2.

An oil heater can be more easily and quickly filled and lighted than a coal heater. Crude oil has been furnished in tank lots at about four and a half cents a gallon and it makes a quick and excellent fire, and an intense heat. It is a fuel that will require little or no attention after lighting, but gas oil is considered far better. By using oil one man can care for three to five acres for four hours, and this is about as long as it is customary to use a heater at any one time. One hundred oil heaters are used to the acre and they can be made to raise the temperature from ten to fifteen degrees. These heaters range in price from fifteen to twenty-five cents apiece. The fire can be easily extinguished; the heater is perfectly adjustable and can be closed so that four quarts of oil will burn twenty-four hours, or the oil can burn like a bonfire and be consumed in two hours.

Heaters may not be necessary, but if needed will be needed very badly and very quickly. Anyone who has ten acres of orchard located in the frost belt can afford to use a carload of oil. This oil may be stored in the orchard in iron tanks or in cisterns made of cement. The tanks cost about \$75 each and the oil may be saved from year to year if not used. Crude oil has its objections. A disagreeable, greasy soot is produced by it which settles on trees, buildings, out-buildings, and even on the inside of buildings.

From the abundance of testimony already obtained from reliable sources in various parts of the country, it is safe to say that the prevention of frost injury to fruit crops has passed the experimental stage and has become a well-established



ARRANGEMENT OF CORDWOOD IN THE YELLOW NEWTOWN APPLE ORCHARD OF W. H. BROWN, IN ROGUE RIVER VALLEY, OREGON

From U. S. Department of Agriculture Farmers' Bulletin 401

fact that can not be controverted or lightly passed by.

For the past two years thrilling frost fights have occurred in Colorado. In 1908 two men saved large crops on the heated half of their places, and lost them on the half not heated. This was a practical object lesson to fruit growers, who as soon as they saw what had been done investigated the matter thoroughly, and the growers at Canyon City appointed an orchard-heating committee, the first in existence. With \$1,000 at their disposal they zealously made experiments to determine just what could be expected in the way of raising the temperature, and what the cost would be. For six months these experiments were tried with every sort of fuel and the various market devices for burning it. After an extensive investigation the committee unanimously recommended oil as fuel, it being as cheap as any other, and the fires

more easily obtainable. It is said that in 1909 there were orchard heaters in every fruit section in Colorado, and in some sections eighty per cent of the orchards were equipped. The statement following was made by a member of the committee:

"The spring of 1909 was severe, proving to be one of the worst in the history of the state, and had lack of protection been as formerly, little, if any, fruit would have been shipped from Colorado. As it is, one of the largest crops in the history of the state will be gathered, and it is estimated that \$4,000,000 was saved by orchard heaters to the fruit interests of the state.

"The experiments of the orchard-heating committee (which tests are a matter of record) showed that the temperature could be raised fourteen degrees on a still night with 100 pots to the acre. The experiments this past spring in time of actual danger fully substantiated the claims made by the committee.

The last night of April, 1909, the thermometer in the Canyon City district fell to seventeen degrees above zero. The orchardists with oil heaters kept the temperatures up to twenty-eight to thirty degrees, or what they considered the safety point. On the preceding night there was a terrible blizzard; the wind blew a gale and there was over eight inches of snow, which kept the oil from burning as freely as it otherwise would, but in spite of these awful conditions the temperature was raised from twenty-one degrees, where it remained for over five hours, up to the safety point.

"As an experiment, several acres were left unprotected by heaters, heating the balance of the orchard. There is a banner crop on the heated orchard, probably more than 15,000 boxes; while on the several acres not heated, on which are 100 trees ten years old in full bearing, of late winter varieties, there will not be a box of apples. One who has never realized the relief of saving the crop can not understand the feeling. In times past Colorado fruit growers have gone to bed knowing that they would be prac-



ARRANGEMENT OF MATERIAL ON OUTSIDE BORDERS OF PEAR ORCHARD OF A. C. ALLEN, IN ROGUE RIVER VALLEY, OREGON

From U. S. Department of Agriculture Farmers' Bulletin 401

tically ruined before morning should break, and feeling absolutely helpless to do anything to protect themselves. This year the aspect is very different; the towns and surrounding country were perfect beehives of activity, and as soon as the danger signal sounded thousands of volunteers hurried to help the orchard men, and for hours the battle waged, never slackening until the great foe was vanquished."

In this orchard district of Colorado an exceptionally large crop of fruit was marketed from the orchards where the heaters were used.

The same experiment has also been tried in New Mexico, where results were equally successful. Mr. Parker Earle, of Roswell, New Mexico, reports a case in the Pecos Valley where 2,600 oil-burning heaters of one gallon capacity were used on a thirty-acre orchard, with the result that a full crop of fruit was saved and sold for \$26,000, while in the rest of the valley the apple crop was almost a complete failure.

Successful frost fighting is comparatively new. It is necessary to have a force of men, industrious, careful, painstaking and observing to the last degree. And it is no pleasant task to rush out into the still, cold night to drudge laboriously all or a part of the night to save your own orchard or that of your neighbor. Unless the work is properly done it had better not be done at all.

As stated, the worst damage may be expected in April, or during the blossoming period and the time when the fruit has set. Any temperature lower than twenty-eight degrees Fahrenheit is likely to destroy a crop. The margin, in degrees, between danger and safety is usually small, the thermometer at such times varying for a few hours at a time from twenty-eight to twenty degrees Fahrenheit. The temperature can be raised by the oil pots at least twelve to fourteen degrees.

The necessity for being prepared for frost fighting can not be too strongly urged upon orchardists. Changes in the weather are sudden and often the unex-

pected happens. A balmy spring morning with a southerly wind and an April shower will cause the fruit buds to burst forth prematurely; then suddenly the wind changes to the north or northwest, the clouds disperse, and a clear, cloudless night follows, when a dangerous frost will probably occur and do much damage unless the orchardist is prepared to save the crop by raising the temperature above the danger point. The freezing of the blossoms is likely to occur in the early hours before sunrise, a time when the temperature usually reaches the lowest mark. To guard against such emergencies everything should be provided for weeks in advance.

Thermometers should be placed in the orchard at convenient distances apart in order to maintain a uniform system of temperature readings, and a thermometer should also be located in an accessible spot near the house, where it may be readily seen at all times. It should not, however, be placed on the house, as the heat from the building will modify the temperature several degrees. A device for



THE HOT BLAST HEATER READY FOR USE

unexpected time, and it is then needed very promptly. The saving of a single crop more than compensates for the expenditure for apparatus many times over.

A rapid lighter for lighting smudge pots is a recent invention, costing about \$4. It consists of a can, holding about five quarts, made of heavy enameled tin, the tubes, ratchet, lever, and valves being made of brass. One gallon of liquid, consisting of half kerosene and half gasoline, or all gasoline, is put into the can. The can is carried in the left hand and a torch in the right. The torch can be so arranged as to knock or pull off the cover of the previously filled oil pot; then with index finger of the left hand the spring-acting lever on top of the gasoline can is moved over the smudge oil pot and instantly there drops a small teaspoonful of gasoline on top of the oil. The torch is immediately applied to the dropped gasoline, which ignites and starts the gas in the smudge oil. It requires so little time at each pot that it is hardly necessary to come to a full stop. One gallon of liquid is sufficient to light 800 smudge pots.

An orchardist does not hesitate to spend \$400 for apparatus and material with which to spray his orchard in order to successfully fight insect pests and fungous diseases. The necessary apparatus for successful frost fighting is neither complicated nor costly, and should be kept on hand, provided the grower's orchard is in the frost belt.

The Weather Bureau publishes a series of maximum and minimum temperatures for the various sections of the United States; it also publishes the dates of probable killing frosts, for both spring and fall, for the frost-belt districts, and in addition to this, its forecasters are able to send out a warning of probable frost injury about ten to sixteen hours before frost is likely to occur.

While orchard heating is comparatively new and the system needs to be perfected in some of its minor details, many thousands of dollars can be saved annually by properly protecting the orchards from frost injury by the use of artificial heat.



SUPPLY OF PAPER SACKS FILLED WITH SHAVINGS AND SATURATED WITH CRUDE FUEL OIL TO BE USED FOR STARTING FIRES
From U. S. Dept. of Agriculture Farmers' Bulletin 401

sounding an alarm of approaching danger which is being used by some orchardists consists of a specially constructed thermometer connected by wire with an electric bell located in the house. When the mercury drops to near the freezing point the bell sounds the alarm in time to arouse the inmates for immediate action. One of these thermometers, or thermostats, costs about twenty dollars.

Another electric appliance that has been used in California is the orchard heater lighter. The heaters are placed at uniform distances apart in the orchard, as previously stated, about one hundred heaters to the acre. By a system of electric wiring and by means of a spark plug it is possible for the grower to light every oil heater simultaneously and almost instantly.

In the areas which are visited by killing frosts this method of insuring against possible injury is a necessity, for if the apparatus is needed, it is usually at some



PAPER SACKS FILLED WITH SHAVINGS AND SAWDUST SATURATED WITH CRUDE FUEL OIL
From U. S. Dept. of Agriculture Farmers' Bulletin 401

PRINCIPLES OF THE NATIONAL ORCHARD HEATER

After two successful years in the manufacture and sale of orchard heaters, we are more enthusiastic than ever over the feasibility of orchard heating. While we are not claiming that our heaters saved all the fruit in the Grand Valley of Colorado, or that we are the only people on earth, we do claim this: that out of the thousands of heaters put out by us we have not one dissatisfied customer, and will say further that we absolutely guarantee our heaters to be as represented.

We have without a doubt the only orchard heater yet put on the market, constructed on scientific principles, burning at all times the oxygen in the air with the gas from the oil through a series of holes in the burner, thus consuming the carbon, which is fuel wasted in heaters that burn direct from the oil, and not only saves fuel, but eliminates the possibility of depositing soot and lampblack on the trees, which many of our fruit growers seriously object to.

One thing we feel very proud of, and that is this: We have put out over three carloads of heaters in this valley the past season, have sold them strictly on their merits; we have recommended using eighty heaters per acre, and have told prospective buyers that if they intended to put only forty or fifty heaters to the acre we preferred that they buy some other heater, and the result is that we have not heard of a single grower who used our heaters as instructed that has not saved a full crop. We have always contended that eighty heaters per acre would sometimes be required to save the crop, and after the experience this spring ninety per cent of the growers will tell you that we have been correct. While some promoters in the past have claimed that forty or fifty heaters per acre was enough, and perhaps may make same claim in the future, the fact that they placed double the number in their own orchards is proof that they had serious doubts about the number recom-

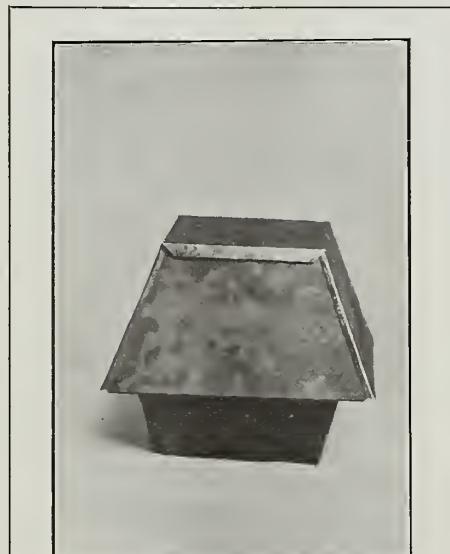
mended by them being enough, otherwise they would not have gone to the expense of providing more heaters for their own use.

We manufacture two styles of oil heaters. One is called the National and the other the Hot Blast. A reservoir attachment can be added to either style, if desired, and you are willing to pay the price, but bear in mind that it will be an actual reservoir and easily recognized as such. A so-called reservoir may have no merit whatever.

The placing of heaters in the orchard is of more importance than a great many think. It is one of the most important features connected with orchard heating. A double row of heaters should be placed around the outside of the area to be heated, say sixteen feet apart, provided



HOT BLAST HEATER WITH THE COVER REMOVED



THE NATIONAL CARBON BURNER

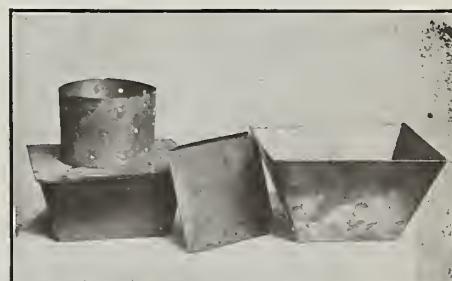
inch, then wire tightly a bunch of waste on the end next to hooks, soak the waste in oil, and you will have a serviceable torch. Use the torch to remove covers when lighting, and to handle the hood and burner in regulating. You will find small hole in side of hood near the top.

Galvanized steel oil storage tanks are the most reliable, say tanks of 1,200 gallons capacity, and use several if a large area is to be protected, locating them in the orchard at the most convenient places for distributing oil to heaters.

Cement cisterns have been used and have given good satisfaction, but care should be used in construction and several coats of hot coal tar or paraffine applied to inside to protect the concrete from the oil. A wagon tank of 300 to 400 gallons capacity is most convenient for handling oil from storage tank to heaters. An ample supply of oil should be provided and any surplus can be carried over to the next season without loss.

The National does not burn direct from the oil, but generates gas and burns gas and oxygen, hence consumes about forty per cent less oil than any other, producing the same amount of heat, and it will not make enough smoke to discolor the fruit. The heater when placed in the orchard is filled with oil, and should be covered tightly to keep out rain or snow. To insure quick and safe lighting, a small piece of waste saturated with coal oil is hung on the inside of the burner by a small piece of wire, say eight inches long, so that half of the waste will be in the oil. (We do not advise gasoline for lighting, as it is always dangerous.) To light heater, remove the cover and touch torch to the waste inside of the burner.

If the wind is blowing or you have only four or five degrees of temperature to fight, burn the heaters with the hood on;



THE NATIONAL COAL POT HEATER

the orchard is not surrounded by other orchards where heaters are being used. Don't place heaters directly under the trees. If the outside rows on a ten-acre tract are well protected little attention will be required to protect an acre or two in the center, and when lighting light the outside heaters first, and should there be a wind, commence on the windward side, so the breeze may carry the heat directly through the orchard.

There is a vast difference of opinion as to lighting time, not only among the best informed growers, but also among the professors who claim to know, and while this difference exists we would advise you to be on the safe side. You know 32 degrees above zero is the freezing point, and if you light at 33 degrees you are on the safe side, it being easier to hold temperature up than to raise it quickly after it has been allowed to fall below the danger point.

Torches are required for lighting and for convenience in regulating. They can be made of heavy wire (No. 6 or 8), doubled and twisted, making a loop at one end, and bend the other end at right angles to form two hooks. Make torches about thirty inches long and hooks one

WHEN BURNING NORMAL
(With hood off)

if more heat is required, turn the hood one-fourth around to let in more air; if still more heat is required, remove the hood entirely, and in an emergency the burner can be raised and set on top of the pan, but this has never been necessary to our knowledge where eighty heaters were used per acre. This heater holds six quarts of oil and will burn from seven to twelve hours, depending upon the amount of air you give it. Understand, it will burn with top cover half or two-thirds on, and to put out the fire put on hood and cover and the fire will be immediately extinguished. Remember to keep heater tightly covered when not in use, to prevent rain or snow getting into the oil.

Many customers who have used our Hot Blast heater say it is properly named. To prepare for quick lighting, instead of hanging waste in this heater, simply lay a small piece well saturated with oil on the disc (the disc is the circular plate at top and inside of heater), and to light,

remove the cover and apply torch to the waste. If only a few degrees of heat is required, say four to six degrees, burn with cover half drawn; if more heat is required, remove the cover. This heater holds nine quarts of oil and will burn eight to twelve hours, depending on the manipulation of the cover. To put out the fire, put on the cover.

When setting the National coal pot heater in your orchard, a supply of good dry kindling, or corn cobs soaked in oil, and good clean nut or egg bituminous coal is essential. (This is true with any coal heater.) To properly fill heaters for use, first put in about one pound of kindling cut six or seven inches long and not split too fine, then fill the pot with coal. An easy and sure way to fire is to use lighters made by taking a piece of baling wire eight inches long, double and twist it together, wrap a little waste on it and soak in oil. These lighters should be prepared beforehand and kept in a dry place. An ordinary coal bucket will hold



THE DIFFERENT PARTS OF THE OLSEN COAL HEATER

sixty to eighty lighters. When necessary to start fires, put the lighters in a bucket, pour oil over them, wire a torch saturated with oil on top of the bucket, light it and from this light the small burners and place one under each heater.

After lighting let pot alone, except to put in more coal as needed; the ashes will fall out without stirring or shaking. Do not let fire get too low before putting on more coal, and to maintain steady, even heat avoid putting on too much coal at one time.

Orchard heating is no longer an experiment, but is as practical as spraying; but to be successful the persons operating the heaters must be attentive and energetic; they must watch the thermometers to note changes in temperature and regulate heaters accordingly; they should not be afraid to burn a little oil and should not permit temperature to drop too low before starting fires, it being easier to hold temperature up than to raise it quickly after it falls below the danger point. With the right heater and plenty of fuel, there is no reason for loss of fruit crop by freezing, if proper attention is given.

The National (oil) heaters have been used extensively for the past two years, not only in Colorado, but in many other states, and have without a single exception done the work required and given complete satisfaction. Don't rely on smoke to protect your crops; it is heat you need, and the National will give a third more heat for the oil consumed than any other heater. Our Hot Blast heater burns on the principle of the down draft stove, consumes a little more oil than the National, but will give out the heat.

Both the National and Hot Blast heaters nest perfectly, and when not in use can be stored in a much smaller space than any other heaters. Our coal heaters stand pre-eminent in their class.

People intending to buy heaters should place their orders early to insure getting them for use when needed. Many growers were unable to get heaters last season on account of failure to place their orders in time. Frosts will come in the future as they have in the past, and every grower should prepare in time to protect his crop.

With means available for protection, there is absolutely no excuse for losing fruit crops by freezing, and small fruit and vegetables can be protected as well as orchards.



SOME OF THE STANDARD MAKES OF ORCHARD HEATERS
By courtesy of Colorado Agricultural College, Fort Collins, Colorado

PRACTICABILITY OF ORCHARD HEATING WITH COAL

BY F. E. BARNEY, MANAGER IDEAL ORCHARD HEATER COMPANY, GRAND JUNCTION, COLORADO

WHILE orchard heating has been practiced on an extensive scale for only two years, it is only in its infancy compared to what it will be in a very few years hence. It is, therefore, not surprising that many growers and some others are yet in doubt as to its feasibility. Some growers who are convinced of its feasibility are in doubt as to which method is the most practical for them to use. Any one who is familiar with the results obtained from orchard heating in Colorado, Utah and other states the past two years will declare that fruit bloom can be saved from freezes in the spring by the production of artificial heat, even though the temperature fall as low as eighteen degrees above zero. Millions of dollars' worth of fruit saved verify this fact. The maxim can then be accepted, "Artificial heat in an orchard will save fruit bloom from frosts or freezes." It is almost incomprehensible after the complete victories the orchard heaters have won during the past two years and the tremendous sales of heaters being made to growers who know of their virtue by actual experience, that there are some people with good intentions but limited experience who declare that it is not only unintelligent but absurd to think of raising the temperature ten degrees and maintaining such raise for a period of several hours. Smudging by making a smoldering fire to produce only smoke, by burning wet straw, sawdust and tar, etc., is all right where the temperature falls but two or three degrees below the danger mark. These smudges must be started before the danger point is reached, as the smoke does not raise the temperature, but prevents it from going within two or three degrees as low in the orchard as on the outside by retaining the heat thrown off by the earth and also by preventing the cold air from settling. It would be foolish to deny that smoke was a help in saving fruit, knowing that on a cloudy night the temperature does not fall as low as on a clear night, other conditions

being equal. The smudge is also very essential when the sun rises if there has not been sufficient artificial heat produced in the orchard to prevent the buds from freezing. The smudge shields the

able but are to be condemned. The up-to-date orchardist does not allow his precious fruit buds to be frozen, but protects them by placing artificial heat in his orchard. Artificial heat can be



EXAMINING THE BUDS IN F. R. BARNEY'S ORCHARD, GRAND JUNCTION, COLORADO AFTER THE FREEZE. IDEAL COAL HEATERS USED. CROP SAVED

frozen buds from the rays of the sun and prevents the rapid evaporation of moisture from their surface. Unless this protection is given to the frozen bud it will wither and die. By having this protection a portion of the buds will gradually recuperate. Of course all will not recuperate, but sufficient to make more or less of a crop if the outside temperature has not gone more than two or three degrees below the danger mark. It is, therefore, seen that smudging alone is not of much benefit after the temperature falls below twenty-eight degrees. Fruit saved in this manner always bears frost marks and much of it is deformed. Knowing that perfect fruit is the only kind profitable to raise, such crude and primitive methods are not only inadvis-

produced by burning anything combustible; oil, wood, composition fuels and coal are used. The majority of the growers of Colorado and Utah favor coal for this purpose, on account of the great volume of heat it produces and the cheaper cost compared with other fuels. The labor of handling coal is not much greater than in handling other fuels, where work is systematized, and equal volume of heat is produced. The growers say they are longer on labor than money, anyway. Where oil costs three cents per gallon or more and coal costs five dollars per ton or less, it is expedient to use coal, so far as actual fuel cost is concerned. This comparison has been arrived at from numerous tests made in Colorado and other states.

Plenty of heaters should be used to produce sufficient heat, and of ample capacity to last through the cold period with very little if any refilling.

A coal heater to be practicable must be held off the ground, as the ground will absorb much of the heat where coal is burned on or very near it. It must have a concentrated bottom draft, which will cause good combustion, thereby releasing all fuel energy possible. An outdoor heater where so many are used must be quick and easy to light, and produce heat quickly after lighting. A coal orchard heater to be practicable must hold a portion of the coal in reserve, so as to eliminate labor of refilling. Where the cold periods last all night it must hold fifty pounds of coal, so as to burn all night without refilling. It must be self-feeding and self-cleaning, thereby burning with little or no attention. An outdoor heater should have heat-spreading principles so that it will be successful in saving ground fruits and vegetables as well as tree fruits. A successful coal heater should burn



LOADING THE IDEAL ORCHARD COAL HEATER FOR THE SECOND TIME, AFTER THE FREEZE OF APRIL 15, 1910. ORCHARD OF F. R. BARNEY, GRAND JUNCTION, COLORADO

close to five pounds of soft coal per hour, which will raise the temperature ten and twelve degrees where fifty heaters are used to the acre. As a rule, the shorter the danger period the lighter the frost. Therefore, every other heater should be loaded lightly and fired for the short periods. If a locality is subject to hard

freezes the growers should equip with more and larger sized heaters. If the cold becomes severe early in the night the heavier loaded heaters are lighted first, and as it becomes colder more heaters are started burning. By this method outdoor heat is regulated as much as is possible.

DEGREES OF COLD WHICH WILL KILL FRUIT BUDS

WENATCHEE REPUBLIC

IN THE life of the peach bud there are four stages at which the crop may be lost because of injury from cold. The first stage is that of the fully dormant buds, as we find them in early winter. At this time, under normal conditions, they can safely withstand a frigid temperature, but if the temperature should remain extremely cold for a considerable time there might be some injury. But it should be remembered that the average peach tree contains about 25,000 buds, whereas 1,000 peaches to the tree would constitute a heavy crop. It will thus be seen that a large number of buds may be killed and yet a full crop remain. At a temperature of zero, or a little below, many of the weaker buds may perish, and at eight or nine below there will be a wholesale slaughter, so to speak, although there is no reason why a sufficient number may not remain under normal conditions, to furnish a full crop of fruit.

The second stage when injury may occur is from the time growth in the buds begins until they are fully open. This is a critical period, as extremely severe weather is apt to occur at this stage. At this time the buds are much more tender than when fully dormant. The temperature that will kill at this time will depend upon the stage of development of the buds.

The third stage is the time which intervenes between the opening of the flowers and until the petals fall. This is the time when late frosts are apt to occur. They are now very tender. At this point the danger point lies somewhere between twenty-six and thirty degrees above zero.

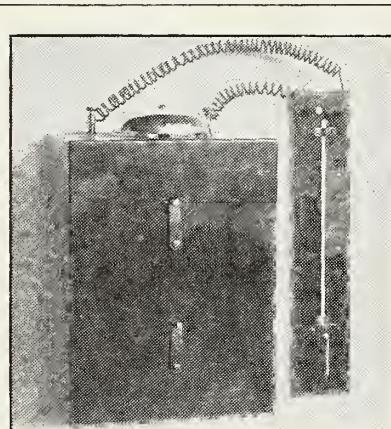
The fourth and last stage begins after the fruit has set and lasts until all danger of cold weather has passed.

Just after the fruit has formed, and at the time when the "shuck" or calyx is beginning to fall, the young fruits can stand a temperature of thirty-two degrees, and beyond this stage the larger the peaches are the less cold they can withstand without injury. It may be repeated that the farther along the

peaches are in their development the more tender they are.

Briefly summarized, fully dormant peach buds can stand real cold weather. When they are appreciably swollen zero is the danger point. When the buds are showing pink they can stand fifteen degrees above zero. When the buds are almost open, twenty-five degrees is the danger point. When they are newly opened, twenty-six degrees would be the point of danger. When the petals are beginning to fall, twenty-eight degrees above zero is cold enough to cause uneasiness. When the petals are off they can stand thirty degrees above zero. When the "shucks" (calyx tubes) are beginning to fall off, thirty-two degrees above zero is the danger point.

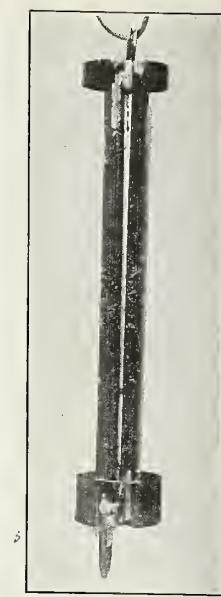
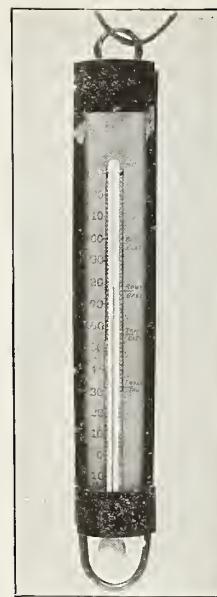
The discussion so far regarding the danger point of cold has been for peaches



FROST ALARM
Manufactured by C. V. Cederburg
Denver, Colorado

only. For apples the conditions would be different up to the time the buds began to swell. During the dormant state in the winter time, apple buds are capable of withstanding any temperature which will not kill the trees themselves. Unlike the peach, apple buds when dormant do not contain all of the parts of the flower fully formed and ready to open up with the appearance of the first few warm days. When the dormant apple buds do begin to grow in the spring they first push out a tuft of leaves, which are followed by a cluster of blossoms. The apple buds are not influenced by a little warm sunshine like the buds of the peach, and consequently they do not begin growing until after there has been considerable warm weather.

Apple buds require a high temperature before they begin to grow appreciably. Peach buds, on the other hand, particularly in late winter and early spring,



Home-made psychrometer, showing the wick bulb extending below the frame, protected by heavy wire loop.

From United States Department of Agriculture Farmers' Bulletin 401

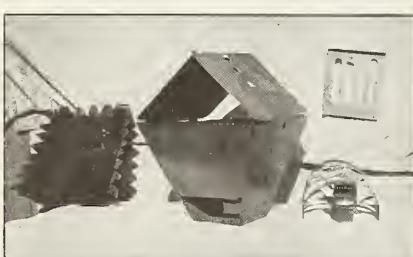
are apt to respond to a single day of warm sunshine by making some growth.

Because the apple blossoms come out one to three weeks later than peach buds open, they are much less apt to be in danger of frost. Under ordinary conditions, orchard heating will be needed for the peach crop far more often than the apple.

When the apple buds have grown sufficiently for the petals to begin to show they can stand a lower temperature than is popularly supposed. At this time they could possibly withstand from ten to twelve degrees of freezing. From this stage onward their resistance to cold becomes less and less as their growth progresses.

When the petals are well emerged but have not opened up, they could stand from four to six degrees of freezing, and as soon as they are open, but not yet fertilized, there would be great danger of injury if the temperature fell as low as two or three degrees below the freezing point. Just at this stage the apple is perhaps in more danger than the peach, apparently for the reason that the fruit is borne on long stems, which seems peculiarly susceptible to injury from cold. From then on, after the flowers have been fertilized, with the petals dropped and the young fruit increasing in size, the slender stems which support the apples are unable to resist a temperature lower than the freezing point. At this stage it is a curious fact that the apples seem to be more hardy than their stems, but if the latter are injured, of course the fruit also suffers.

In giving danger points for the various stages of development in both the peach and apple, the writer has tried to be conservative. Experience in artificially freezing thousands of peach buds has shown that in the various stages mentioned they will often withstand lower temperatures than those given as danger points.



COMBINATION COAL AND OIL HEATER
Manufactured by Frank Buehring
Grand Junction, Colorado

THE ANNUAL CONVENTION OF THE PACIFIC COAST ASSOCIATION OF NURSERYMEN AT WALLA WALLA

NOT in the eight years of its history has the Pacific Coast Association of Nurserymen held a more successful annual convention than the one which closed in Walla Walla, Washington, the fifteenth of July, after a three days' session noted for its attendance, harmony of spirit and business diligence.

From the time the nurserymen were called to order in the commodious lecture hall of the Walla Walla Young Men's Christian Association building until the convention adjourned sine die, there was not an idle minute.

The president, S. A. Miller, of Milton, Oregon, in his annual address reviewed the work of the past and spoke of the gratifying changes in the nursery business of the last year, compared with other years, and that the outlook for the future is unusually bright.

The convention passed strong resolutions in compliance with the recommendations of the president in the matter of quoting prices in advertising, and also in the matter of receiving more rapid transportation for nursery stock, as, owing to the perishable nature of the young trees and plants, thousands of dollars are lost to the nurserymen annually on account of the unreasonable delays in transit.

Almost every subject pertaining to nursery stock and fruit trees was discussed by the nurserymen, and many valuable papers were read before the convention, all of which were of great value to fruit growers as well as nurserymen.

A noticeable feature of the reports made from the various sections of the country, was the general statement of increased demands for orchards and vineyards. F. E. Jones, of British Columbia, said that the people of the Dominion of Canada are going wild over fruit, and the supply of nursery stock does not nearly equal the demand at the present time.

A warning note to all orchardmen was sounded by the new president, George C. Roeding, of Fresno, California, when he opposed the planting of too many trees of one kind of fruit, to the exclusion of other varieties. He said to get the best results, year in and year out, a diversity of fruits should be grown, so when one is a failure or there is especial demand for a certain kind, dependence will not all rest on a single variety.

It was shown plainly that the nurserymen have contributed largely to the betterment of our country by encouraging the highest development of the soil, which makes the path of life more pleasant for those who are to follow them, and that their ambition and purpose is to continue to pursue such ways in their toil as to make the world better for their having lived in it.

All the nurserymen present were free to state that this was the most successful convention in the history of the association, and spoke in the highest terms of the treatment given them by the citizens of Walla Walla.

The convention closed on Thursday by over fifty nurserymen boarding a special interurban car as guests of the Milton Nursery Company, the business establishment of A. Miller & Sons, of Milton,



S. A. MILLER
Of the Milton Nursery, Milton, Oregon
President Pacific Coast Association of Nurserymen
1909-10

Oregon. The business of the association having been completed the evening before, everyone was free to enjoy the day, and a jollier bunch of men would be hard to find.

Arriving at Milton at 10 o'clock a. m., automobiles and carriages were in waiting, and the entire party were driven to

the grounds of the Milton Nursery Company, which cover 200 acres of rich bench land and where over one million and a half of young fruit trees of all the leading varieties are growing.

When the party had seen all there was to be seen at the nursery, they were again loaded into the conveyances and taken to the home of Mr. A. Miller, who is the pioneer nurseryman of the Pacific Northwest. Here a delightful luncheon was served in the shade of the trees that were planted by Mr. Miller nearly forty years ago, when he decided to make his home here.

After several short speeches were made in just praise of the Milton Nursery, its developers and owners, and the surrounding country, a vote of thanks to the host, with rousing cheers and the singing of "Auld Lang Syne," brought the happy meeting to a close, after which the party was driven back to Milton where they took their car and returned to Walla Walla.

From the standpoint of representation, this convention was probably unequalled on the Pacific Coast, there being nurserymen present from every state west of the Rocky Mountains, and also British Columbia.

Officers for the following year were elected as follows: George C. Roeding, of Fresno, California, was chosen president; C. A. Tonneson, who has served as secretary of the association since its organization eight years ago, was unanimously re-elected. State vice presidents were elected as follows: For Washington, George Peaslee, of Clarkston; for Oregon, J. B. Pilkington, of Portland; for Utah, E. M. Tyson, of Bingham City; for California, W. B. Eberly, of Miles; for Montana, D. J. Tighe, of Billings; for Idaho, C. P. Hartley, of Emmet; for British Columbia, Richard Ritz, of Victoria.

The next annual convention of the Pacific Coast Association of Nurserymen will be held in the State of California, probably at San Jose.



LUNCHEON SERVED THE VISITING PACIFIC COAST ASSOCIATION OF NURSERYMEN BY THE MILTON NURSERY COMPANY AT THE HOME OF A. MILLER, MILTON, OREGON
JULY 15, 1910

METHODS OF PREVENTING THE EFFECT OF FROST

A COMMITTEE of Colorado fruit growers, Messrs. A. B. White, Grand Junction; Charles Oliver, Montrose, and George H. Sawade, Palisade, submitted to the Fruit Growers Associations of Montrose, Mesa and Delta Counties:

"Your committee, chosen to investigate the various frost preventative devices and to ascertain the cheapest and most practicable safeguard against frost damage to fruit, as applicable to our particular section and climate conditions on the Western Slope of Colorado, have, as per previous arrangement and instructions, visited Redlands, Riverside, Los Angeles, Fresno, San Jose and other out-

lying sections in California, where it seemed most advisable to investigate, and your committee can truthfully affirm that, after investigating the various methods and means of preventing frost damage to fruit, throughout the fruit growing district of California, which we visited, we saw no individual demonstration of what can be done by heat to prevent frost damage, better than the experiments of a few of our own energetic citizens on the Western Slope of Colorado during last April, and while unprepared and working under adverse conditions, they have achieved success, this having blazed the way for others to follow. They deserve the thanks of our

own people for their faith, courage and energy.

"In support of our own experiments last spring, your committee has a large accumulation of corroborative evidence which leads us to believe that there is no necessity for a grower to lose his fruit crop under the degree of cold experienced here last spring.

"We were somewhat surprised to learn that the growers in California do not generally resort to smudging (as they call it), even in the sections where the lowest temperatures are most prevalent, but we were able to find in these sections a few live, progressive, energetic men who have practiced smudging with various devices and materials for several years, and always with perfect success.

"We located and investigated a number of interesting and successful experiments, of one or two of which it seems pertinent to speak. The superintendent of a seven hundred acre orchard of citrus fruits related to us his experience with a section of this orchard, the fruit on which was invariably killed by severe freezing, and the syndicate owning the same had ordered these trees grubbed out and the ground seeded to alfalfa. The superintendent begged one more year to try and save the crop, which he successfully did by burning oil. Since then he has discarded oil and is burning coal in small wire baskets, one to each tree, with the result that these trees were not grubbed out, but, with the aid of heat, are each year maturing a crop.

"A sample of this basket has been forwarded to Grand Junction, where it may be seen and tested, together with other devices, in the near future. The cost of this basket, together with a stand upon which it sets, is thirty cents. It is fair to say, however, in connection with the above, that this man discarded oil, which is much cheaper than coal in California, and used the latter for the reason that, as he claimed, the burning oil left a greasy spot upon the fully grown fruit. We do not think, however, that this deposit of soot would be any objection in Colorado, as our fruit is so small at the time of firing that it has ample time to grow off and disappear before the fruit is matured. It must not be inferred from the above that we learned of any general objection to the burning of oil on account of the soot, as this one case was the only one which came to our notice.

"Many of the growers on the Pacific Coast still maintain that the smudge or smoke is the saving element for their fruit. An



SECTION 10 DONALDSON'S FRUIT EXPOSITION, MINNEAPOLIS, MINN.

BOX APPLES FROM WENATCHEE VALLEY, WASHINGTON, FOR EXHIBITION AT THE DONALDSON FRUIT EXPOSITION, TO BE HELD NOVEMBER AND DECEMBER OF THIS YEAR

interesting example of this theory was the superintendent of a large orchard in Santa Clara County, who cut five gallon oil cans in two, making two pots of each can. These he filled with crude oil, using forty to the acre. When suggested to him that it was the heat which brought him success in the saving of his fruit crops, he demurred, maintaining that it was the smudge or smoke. Your committee did not press the point.

"And here it seems pertinent to say that your committee is of the opinion, after a thorough investigation and study of the subject, that smoke, even in connection with heat, forms but a small element towards frost prevention; that heat is absolutely essential, and that smoke without heat is, in our climate at least, practically worthless.

"There are various devices and materials used in California, only three of which it seems desirable to make note of at this time. First, the Occidental Fuel Company, of Los Angeles, are making a new smudge material which they put up in sacks. It is made from shavings and other waste material saturated with crude petroleum. It burns splendidly and is very effective in Southern California, where it is being used. But, the pots in which this material is burned are rather expensive, costing sixty cents, and the material itself costs \$10 per ton in California, and even if it could be manufactured in our state, its price (\$10 per ton), as against our cheaper coal and oil would bar it from general use.

"We now have oil and coal to be considered, both of which are available in Colorado, and in the judgment of your committee, both may be made very effective for frost protection if intelligently used by the growers. Under our climatic conditions it would seem impossible to bank smoke as a protection against the sun's rays on a morning following frost. This being true, it only remains to make a sufficient and intelligent application of heat which will prevent the fruit from chilling, and thus eliminate the danger from the sun's rays the following morning. The question of expense, facility in preparing, lighting and tending will no doubt determine the nature of the material used by each individual grower.

"While oil, after first being prepared for use with the necessary tanks, etc.,



STOREROOM ON THE LINER HAMBURG, OF THE HAMBURG-AMERICAN LINE, WHICH CONTAINED APPLES, PEARS, ORANGES, GRAPE FRUIT AND PRODUCE FROM THE PACIFIC COAST STATES FOR THE ROOSEVELT PARTY EN ROUTE TO SOUTH AFRICA

From Leslie's Illustrated Weekly, May 6, 1909

can possibly be handled from day to day with more facility, lighted quicker than coal, with the assurance of a steady heat until the oil is consumed, and no particular care during this period.

"On the other hand, coal would seem much the cheaper fuel, requiring no expensive storage facilities, and there is no doubt, if carefully prepared so as to insure quick lighting, and given proper attention throughout the night, a steady heat may be maintained and the required result achieved.

"We neither saw or heard of any experiments having been made with large fires, and few to the acre, and would caution our growers to be careful about this experiment with large fires, at least for the present, but rather to follow the beaten path of small fires and many to the acre. The smudging season, both in Colorado and California, having long since passed, your committee has had neither time nor opportunity to test out the number of fires necessary to be used in different degrees of cold; in fact, we believe that this phase of the subject will take years of experience to determine; in the meantime, we had better use plenty and succeed, than to use too few and have our fruit chilled.

"We have noted during our investigations in California that from forty to eighty fires are being used to the acre, the number lighted being determined by the particular location, and the degree of cold encountered.

"More fires are used on the outside of the orchard than in the center, and it is the usual practice to light fires before the thermometer gets down to freezing,

claiming that it is easier to hold the temperature where it is than to raise it after it has dropped below freezing point.

"Your committee has not conducted any series of experiments as to the best device for burning either coal or oil, and therefore recommend none. In fact, we consider it more logical that these experiments be conducted in our own countries and with the particular material at hand, which we shall be compelled to use, and we therefore recommend that our different associations immediately appoint committees who shall at once proceed to conduct a series of experiments with the materials we have at hand, with the view of ascertaining and recommending to our growers the best and cheapest device for burning either coal or oil, and the probable cost per acre of either method. This information was impossible to obtain in California; many of their methods were crude, their material, both coal and oil are different from ours, which would render experiments there questionable, when applied to a different grade of material here. As there must be an expenditure of many thousands of dollars by our growers in preparing to fight frost, it seemed desirable, before advising this expenditure, to obtain corroborative evidence to our own experiments in protecting fruit in a low degree frost. Such corroborative evidence we have in plenty, and it is our firm belief that if any grower in Western Colorado loses a fruit crop from frost, with the same degree of cold we experienced last April, it would be because he is unwilling or unable to avail himself of the material at hand for firing, and an intelligent use of the same."

RELATION OF WEATHER BUREAU TO HORTICULTURE

BY EDWARDS L. WELLS, SECTION DIRECTOR, WEATHER BUREAU, BOISE, IDAHO

THE word horticulture comes from two Latin words meaning enclosure and cultivation, and in its original sense was used to designate the growing of fruits and vegetables in enclosures about the homestead, while the word agriculture was used to designate the growing of grains and grasses in the open fields without. In modern times the raising of fruits and vegetables has passed beyond the garden state, and the word horticulture has come to stand for one of the leading industries of the country. It is an industry that tends toward the advance of civilization; because it requires as the price of success a high order of intelligence and unremitting industry; by its large returns and the nature of the work it permits a dense population and hence more social intercourse; and the problems of caring for the crop and marketing the produce call for community co-operation. Not only does horticulture raise the standard of life for those engaged in it, but in its modern development it contributes much to the health and happiness of the whole people, by furnishing as articles of ordinary diet fruits and vegetables, once known only as delicacies on the tables of the rich.

Some horticultural products will grow almost anywhere, but as a rule even these reach their highest development under certain conditions of climate, and not frequently the ideal condition is most nearly reached just within the border line of critical temperature. Other products, more tender, can be grown only where the most favorable conditions obtain. Still others, perfectly hardy when grown in the normal season, are, under favorable conditions, grown out of season, for greater profit. The growing of such products is an industry very dependent on climatic conditions and weather changes, and the Weather Bureau, realiz-

ing this dependence and recognizing the importance of the industry, seeks to keep in touch with the importance of the industry, seeks to keep in touch with it and to serve it wherever possible, and the

stations in the various states, and the weather records at these stations are taken ordinarily by means of instruments loaned by the Weather Bureau. The Weather Bureau is now in co-operation



WESTERN COMMERCIALLY PACKED APPLES ON EXHIBITION AT THE STORE OF G. M. H. WAGNER & SONS, CHICAGO

relation of the Weather Bureau to horticulture is becoming closer every season.

Because successful horticulture depends on the right choice of a location for the particular fruit or vegetable grown, it becomes necessary for the horticulturist to know in advance not only what are the climatic conditions necessary to the highest development of that fruit or vegetable, but also where those climatic conditions are to be found. In answering both these questions the Weather Bureau has an important part.

A large part of the work of experimentation in determining the needs of various plants in the way of soil and climate is carried on by the experiment

with the Bureau of Plant Industry in determining the meteorological conditions necessary for the growth of certain valuable plants, and as a result of these investigations it is hoped that many products now imported will be grown at home. The report on "Relations Between Climates and Crops," by Cleveland Abbe, of the Weather Bureau, made public in 1905, is the most complete work of its kind in existence.

If the part taken by the Weather Bureau in the study of the needs of the plant is in a measure indirect, the work of determining where these needs can be met is direct, for weather records are kept by the observers of the Weather Bureau every day in the year at more than three thousand places in the United States. These records are kept by means of the best instruments made. At about two hundred places they are kept by trained observers, who are making the weather their life study. At the others they are taken by public-spirited citizens, selected for their intelligence and interest in meteorology, under the supervision of Weather Bureau officials of experience, and all reports are subjected to the closest scrutiny before they are given the seal of official approval. These reports are tabulated and printed in convenient form, and are not only on file in Weather Bureau offices in all the principal cities, but find circulation in every state in the Union and in many foreign countries. By reference to these reports the prospective horticulturist is able to inform himself as to the climatic conditions of almost any locality, including temperature, probable dates of killing frosts, and amount and distribution of precipitation. If the particular information he desires does not appear in the printed reports he can call at the nearest office of the Weather Bureau, or write to the section



DISPLAY OF CALIFORNIA FRUIT UNDER THE DIRECTION OF GARCIA, JACOBS & CO. GOLDEN WEST EXHIBIT, 1909, EARLS COURT, LONDON

director of the state in which he contemplates locating, and get more complete information.

Some of the best fruit and vegetable-growing regions in the United States are located in the arid region, and are hence dependent on irrigation. The data collected by the Weather Bureau relative to the rainfall and snowfall in the mountains are eagerly sought by irrigation engineers, and form the principal basis for estimating the water supply for a given irrigation project, while the monthly snowfall bulletins form the best basis for an estimate of the water supply for an approaching season. In 1908 a new plan for gathering data relative to snow fall was inaugurated. This plan provides a small compensation for snowfall observers, and better apparatus for measuring snowfall, sends the section directors into the field to personally supervise the work, and makes use of valuable assistance rendered by other Government bureaus. This plan, when carried out in full, will greatly enhance the value of the service to the irrigation engineer.

In many sections where ordinary field crops are grown without irrigation, wind mills are extensively used to pump water with which to irrigate fruit and vegetables. The wind records of the Weather Bureau play an important part, first, in determining whether or not pumping by wind power will be practicable, and secondly, in selecting the equipment best suited to the conditions of the locality.

In recent years considerable attention has been given to local temperature surveys. Every locality has its cold spots, due to topography; and in mountainous regions the local differences in temperatures are often marked. To be able to find the local isothermal lines and thus avoid planting tender fruits and vegetables in frosty spots is worth a great deal to the horticulturist. While the funds appropriated to carry on the work of the Weather Bureau at present are not sufficient to provide for the purchase of instruments and pay of observers for these temperature surveys, its officials

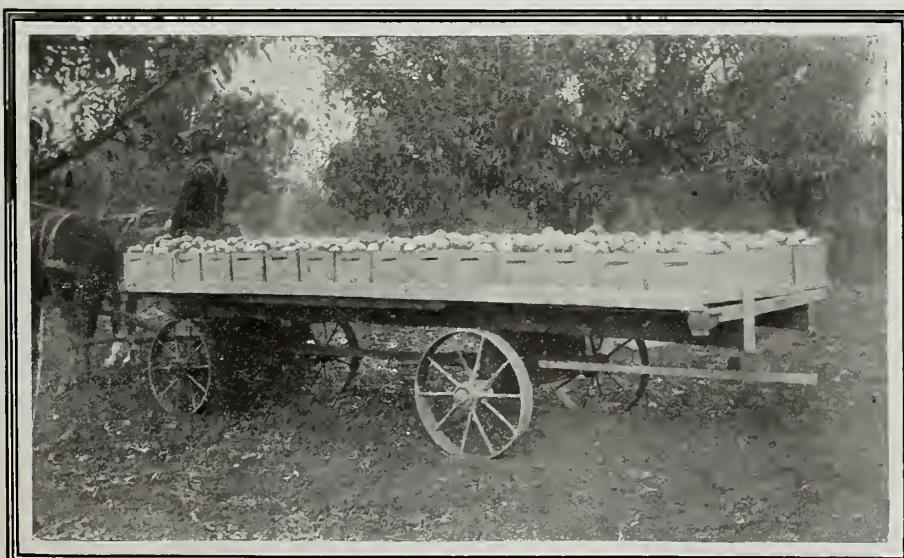


CROWD OF INTERESTED FRUIT BUYERS AT FRUIT AUCTION OF GARCIA, JACOBS & CO., COVENT GARDEN, LONDON

recognize their value and often lend important assistance in selecting and locating instruments and correlating the data obtained. It is hoped that in the near future the means will be provided to carry out this work on a uniform plan.

Nearly all fruits, and many vegetables, are subject to ravages by insects, and the combating of these insect pests engages the attention, not only of one of the great branches of the Government, but of state officials and private investigators everywhere. It is known that the life history of many of these insects is modified very materially by weather conditions. The Weather Bureau not only furnishes much of the data upon which the investigations are based, but, when the relation between the weather and the life history becomes known, the weather records will tell when to spray in order to make the destruction of the insect most complete.

Probably the closest relation of the Weather Bureau to horticulture is through the system of frost warnings. The fact, mentioned in the foregoing, that certain horticultural products reach their highest development just within the border line of critical temperatures, and the added fact that the weather from day to day is made up of normal events rather than abnormal, make it necessary that the grower be informed when dangerous conditions are expected, and be taught how to prepare for these conditions. The citrus fruits are evergreens, and are susceptible to injury from frost at all times of the year, and although there is no part of the United States, aside from the Florida Keys, where freezing temperatures have not been experienced, the growing of citrus fruits is an industry that is assuming great proportions. In the Gulf States tender vegetables are grown throughout the winter. In the trucking and citrus growing regions the ordinary conditions are favorable, and it is only occasionally that unfavorable conditions occur. When they do occur, however, much damage results, unless protective measures are resorted to. Some of the most profitable orchards of the United States are now located in the valleys of the Northwest, where spring comes slowly, and where in some years there are frequent cold spells and occasional nights of frost till late in the season. In those valleys, during the blooming season, as in the South in winter, just a few degrees difference in temperature on a single night may mean the difference between a handsome profit and a total loss on the year's work, and just a little protection is all that is needed to make the required difference. To advise the growers when dangerous conditions are expected, and to assist in teaching them how to prepare for unfavorable conditions, are the tasks undertaken by the Weather Bureau. The tasks are not easy, but already marked



GOOD STYLE OF LOW ORCHARD WAGON USED BY M. O. LOWNSDALE, LAFAYETTE, OREGON

results have been obtained, and still better results will be realized when Weather Bureau stations are closer together, when temperature surveys have been extended, and when the growers organize more generally and systematically to make use of what the Weather Bureau has to offer. Already enough is often saved by a single warning to cover the operating expenses of the Weather Bureau for an entire year.

Frost warnings are telegraphed to about six thousand addresses and placed within call of about two million telephone subscribers whenever conditions justify them; and are further disseminated by means of maps, postal cards, rural free delivery slips, flags, whistles and the daily press, so that there are few horticulturists who cannot have

tions during the coming season, if needed.

Protective measures used consist of covering with screens or canvas, as in the extreme South; banking, as in the case of young trees; covering with straw or earth, as in the case of small vegetables or berries; turning water into irrigating ditches, as in the irrigated regions of the West; flooding, as in the cranberry marshes of Wisconsin, and elsewhere, and building fires of different materials, varying with the locality and with the amount of protection needed.

By means of publications, lectures, press articles and the personal efforts of progressive officials, the Weather Bureau has done much to disseminate information as to the best methods of protecting fruit and vegetables from frost. "Frost Fighting," by McAdie, and "Frost: When

In picking and marketing berries, transplanting young plants, and in many other ways the rain forecasts serve an important purpose.

A severe wind storm sometimes plays havoc with ripe fruit on the tree. Many growers, when the Weather Bureau advises that wind may be expected, put their entire packing force at work picking, thus preventing serious loss.

In former times most of the fruit and vegetables were used in the immediate locality where produced. Now large quantities are shipped, some being carried across the continent and a smaller amount being exported. The handling of horticultural products in transit has come to be a business in itself. The perishable nature of these products makes it necessary to use every precaution to protect them from injury in shipping. Different products retain their freshness best under different conditions. A car that is too cold for bananas may be too warm for strawberries. The shipper must know the requirements of each commodity and must be prepared to meet them. The Weather Bureau has made a study of this subject and farmers' bulletin No. 125, by H. E. Williams, who is now assistant chief, gives the results of that study.

Knowing the requirements of the product to be shipped the intelligent shipper is aided greatly in meeting them by the Weather Bureau reports and forecasts. If warm weather is indicated for the period during which the shipment will be on the road, or if the shipment will traverse warm regions en route, action should be taken to have the cars ventilated or artificially cooled. If cold weather is expected, or the shipment is destined for a cold region, the cars must be closed, and perhaps artificially warmed. If extreme conditions are indicated, it may be wisest to withhold shipment till the weather moderates. By taking advantage of the approach of favorable weather conditions along the route of shipment a consignment may be forwarded with less than the usual amount of cooling in summer, or less than the usual amount of protection in winter, and considerable expense saved. When favorable conditions exist, and are expected to continue for some time, products that are ordinarily forwarded by rail may be sent by water, at a less expense. What has been said of shipping applies with equal force to the storing of perishable products.

The market price of fruit and vegetables is directly influenced by the various reports of the Weather Bureau, and the relation between weather conditions and prices will become more constant as those interested learn how to make use of these reports. The writer has received many requests from growers and dealers who want to know the weather conditions in the various fruit growing regions of the country.

In summing the matter up, it may be said that the Weather Bureau assists the intelligent horticulturist in selecting a location, in planning his irrigation works, in protecting his crops from injury by frost, rain and wind, and from the ravages of insects, and in harvesting, shipping, storing and marketing the product of his labor.



PACKING AND SORTING PRUNES AT ASSOCIATION WAREHOUSE, MOSIER, OREGON

them. In the Middle West and the more thickly settled sections elsewhere, the telephone is the most popular means of dissemination. In the South the railroads have adopted a system of whistle signals, and by this means are able to warn the growers living several miles on each side of the track. In California a system of special information postal cards is obtaining favor. These cards are sent out immediately on the receipt of information of the approach of frost conditions, preceding the regular reports by several hours.

At Grand Junction, Colorado, where protective measures are used extensively and with great success, the local office of the Weather Bureau is made the headquarters and bureau of information for the growers on cold nights, during the blooming season. The office is kept open throughout the night, and receives hourly reports of temperature by telephone from various parts of the valley. Whenever it is shown that the critical temperature is being approached in any locality, the growers in that locality are awakened and start their orchard fires. This plan will be put into operation in other sec-

to Expect It and How to Lessen the Injury Therefrom," by Hammon, are the leading publications from the Weather Bureau press on the subject. "Notes on Frost," by Professor E. B. Garriott, chief of the forecast division of the Weather Bureau, printed as farmers' bulletin No. 104, has recently been revised and reprinted under the original caption, and contains a statement of methods used and results obtained in various parts of the country. Many of the officials of the Weather Bureau lecture at farmers' institutes, and most of them use "Frost Fighting" as one of their subjects. Some of the apparatus used in frost prevention was designed by officials of the Bureau.

In the raisin growing districts in California the rain forecasts issued by the Weather Bureau are of great value to the growers. The raisins are cured in trays in the field. When rain is expected the trays are covered, and thus saved from injury.

In regions where insect pests abound and spraying must be done, it is important that it be done in dry weather, as rain washes off the poison before it has accomplished its work.

FORECASTING THE WEATHER NOT GUESS WORK

BY EDWARD A. BEALS, DISTRICT FORECASTER, PORTLAND, OREGON, IN THE OREGONIAN

THE history of weather forecasting falls into two distinct periods; the first includes the period prior to the recognition of the cyclonic character of storms, and it ended about the year 1835, which was also the year when the telegraph came into use; the second is the period from 1835 up to the present time. From the date of the invention of the barometer, in 1643, up to 1835, slow progress in the right direction was being made, but the forecasting of the weather prior to the recognition of the cyclonic character of storms was practiced only by charlatans, astrologers and their ilk, and these people could not give any logical reasons for the deductions they made.

In Etruria, long before the days of Roman civilization, books were written devoted to the divination of natural phenomena, including all phases of the weather, and especially those pertaining to lightning, which were considered of sufficient importance to merit a separate classification. The Etruscan priests were famous weather prognosticators and they claimed the power of creating thunder storms and other disagreeable weather conditions, but it would often happen that their claims were not fulfilled, and on these occasions they ingeniously said they had taken pity upon the people and through their arts had diverted the impending calamity. Thus they gained in fame equally as well when the weather turned out bad and the prediction was verified as when it turned out good and the prediction was not verified.

Unfortunately for the weather forecaster of today, the public is not so easily satisfied, and if the weather does not turn out as predicted, the weather man is blamed and the people think they have been imposed upon; some people even go so far as to blame the weather

man for all the bad weather that occurs, and I once had a delegation of Chinamen call at my office for the purpose of examining the instruments used in recording

details about Chinese methods of controlling the weather in his day. He says the Chinese astrologers would, in the midst of storms, ascend the palace of the



FINE EXHIBIT OF WILLAMETTE VALLEY, OREGON, APPLES AT THE ANNUAL ALBANY APPLE SHOW

weather conditions, and I am sure that some, if not all of them, thought our instruments were used for making weather rather than for recording its behavior.

Marco Polo, in his book written about 700 years ago, notes some interesting

Great Kahn and suffer no rain to fall thereon, while beyond the palace heavy rain would be falling over a wide area. He also gives instances besides this one of the marvelous powers of these men in foretelling weather and other events.

I judge the Chinese were more strict with their astrologers than were the Etruscans, as we read that two of them named Ho and Hi were beheaded in the twenty-second century B. C. for getting drunk on the day of an eclipse of the sun and not being able to supervise the performance of the required rites, which consisted in beating drums and shooting arrows to frighten away the mighty dragon that was about to swallow up the Lord of Day.

It was an early custom of the Greeks and Romans to insert predictions of the weather in their calendars, and this custom is followed today by some of our almanac makers. In the seventeenth and eighteenth centuries, the book having the largest circulation, next to the Bible, was the almanac, and all almanacs in those days contained forecasts of the weather, as well as many foolish directions for conducting the everyday affairs of life. You were told in them what days were lucky and what were not, when to take a journey and when not to take one, and so small a matter as getting the hair cut had to be done on certain days in order to insure a successful operation.

Many famous men contributed weather predictions to these almanacs, among

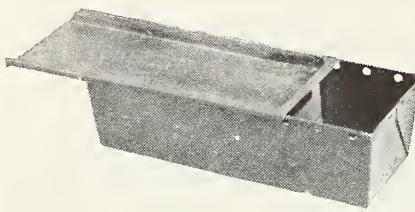


HAULING FRUIT TO THE ASSOCIATION WAREHOUSE AT MOSIER, OREGON

Continued on page 50

CABLE ADDRESS:
"SMUDGE," GRAND JUNCTION

WESTERN UNION AND INTERNATIONAL CABLE CODES USED

JAMES L. HAMILTON,
PresidentTHE HAMILTON RESERVOIR
ORCHARD HEATER COMPANYManufacturers of
ORCHARD HEATING DEVICES

FACTORIES AT WHEELING, W. VA.

Branch Offices:
New York City Jacksonville, Fla. St. Louis, Mo.

250,000 IN USE

The

Hamilton Reservoir Orchard Heater

This "draw the cover and regulate the fire" heater is the only one that meets all the requirements of temperature. Please note that in the event of a wind three or four times as much heat and smoke will be required to secure equal results. This device which permits of instant regulation is the only one known that will give you the desired results. Because of its extreme simplicity of construction and operation it is the only heater that is practical on a large acreage. We offer in evidence the following letter and solicit your inquiries:

Kansas City, Missouri, June 13, 1910.

Mr. James L. Hamilton, Grand Junction, Colorado.

Dear Sir: Replying to your favor of the 4th instant, will say: The heaters I bought of you this spring have proved all you claim for them, and enabled me to save all the fruit in that part of my orchard where used.

My orchards are located at Lanigan, Missouri, one hundred and ninety-five miles south of this city, and for the past two years have not produced any fruit, owing to the late spring frosts, and the same conditions would have existed this year had it not been for the heaters.

The heaters arrived in March and I distributed them in my orchard forty to the acre, but the first night I had to light them, which was the fifth of April, I found that the number was not sufficient for more than possibly six degrees of frost, though but two or three degrees' raise was sufficient for that night. I still had some heaters that I had not placed out, so I then put out five more to the acre in most of the orchard, to be ready for the next call "of the frost," which came on the 18th of April, also the 19th, when we burned the heaters some three or four hours each night, with better results than our first night, showing that we were wise in increasing the number to the acre.

We had our final fight on the night of the 25th of April, when the temperature went down to 26 degrees, and had to light up at 11 p. m. and burn until morning, and at no time did the cold inside the orchard reach lower than 30 degrees, so that our crop was not hurt in the least, and I believe from present indications I have the best conditioned crop of apples that has ever been produced in that section of the country, or any part of the Ozark region, which could not have been so had I been without the heaters.

I firmly believe in the heaters for overcoming the spring frosts in orchards, and from my experience would not recommend less than fifty to the acre, with the outside well protected all around.

I protected some ONE HUNDRED AND TWENTY-FIVE ACRES with the FIVE THOUSAND HEATERS I bought of you this spring, and was enabled to do this owing to the lay of my land, as in some parts south of my main orchard I used but FORTY HEATERS to the acre.

From the experience of this spring I will want to equip the rest of my orchards with your heaters next spring, which will require as many more heaters as I now have.

Yours very truly,

R. B. Dolsen.

Note this letter also confirming the above and then determine whether orchard heating pays, and remember that at the time Mr. Dolsen heated there was a wind blowing, and no other crops are reported saved in that section because of the inefficiency of the small heater.

THE FRUIT GROWER

St. Joseph, Missouri, September 20, 1910.

Mr. James L. Hamilton, Grand Junction, Colorado.

My Dear Hamilton: The other day we sent a man down to Lanigan, Missouri, to get a story of an orchard which used your heaters the past spring. I was particularly anxious to get this story for two reasons: First, because the orchard has never paid on account of the uncertainty of crops, and the original owner recently sold it to a man who bought a lot of your heaters, and this year it is estimated they have about \$45,000 worth of apples. It is not only the best crop this orchard has ever had, but it is the best crop in that section, and speaks wonders for orchard heaters here in the Missouri Valley.

Yours very truly,

The Fruit Grower.

James M. Irvine.

The Hamilton Reservoir Orchard Heater Co., Grand Junction, Colorado

THE

Troutman Orchard Heaters

"The World's Standard of Efficiency and Economy"

The Troutman Heaters have had the greatest sale of any orchard heating device. They are built on scientific principles. The center draft is so constructed that air is forced under pressure into the burning gases, thus creating a better and more perfect combustion.

When burning air the consumption of fuel for heat produced is much less. This saving in oil with the Troutman Heaters will pay for them in ten burnings, and all other heaters will be costly if given away.

For any other device to be as cheap as the Troutman, even the first year, will have to sell for ten cents less.

Special Discounts on October Orders

The new price list goes into effect November 1, but all orders mailed in October will be accepted at the old price. This saving will pay the freight.

The Troutman Attachment



Enables perfect regulation of heat. The only "small fruit" heater on the market. Makes protection of strawberries, etc., perfect, economical and simple. For use with all sizes.

The Troutman "Intermediate"



The same heat from start to finish. Will burn through the longest night without refilling.

The Troutman "Standard"



Deep flange makes cover windproof. The Troutman GALVANIZED heaters are the only devices on the market that are non-rustable and non-leakable. These will last 50 per cent longer than plain black iron heaters.

DESCRIPTION OF TROUTMAN HEATERS BY NUMBERS

No. 1, holds 5 quarts of oil and burns 7 hours.
No. 1½, same size as above, with galvanized body.
No. 2, holds 7 quarts of oil and burns 10 hours.

No. 2½, same as No. 2, with galvanized body.
No. 3, holds 6 gallons of oil and burns 35 hours.
Lard Pail Heaters, hold 5 quarts of oil and burn 4 to 5 hours.

Small Fruit Attachment for all sizes.

When you think "orchard heaters" think "Troutman." With the above sizes we can supply you with whatever you desire in the way of an orchard heater. Send for our year-book for 1910-11. Place your orders early. Orchard heating is great insurance; try it. Agents wanted.

For full information, address

The Round Crest Orchard Heater Co.

Canon City, Colorado

FORECASTING THE WEATHER NOT GUESS WORK

Continued from page 47

them being Kepler, the celebrated astronomer. Almost the first prophecy Kepler made was that the coming winter was going to be a severe one, and it came true. A noted astrologer named Shoffler predicted a universal deluge for the year 1524 and his prediction excited widespread alarm throughout Europe. It was the means of causing a prominent official in France to build a Noah's Ark, which, however, was never used, as the year turned out to be very dry, and it has been known ever since as the year of the great drought.

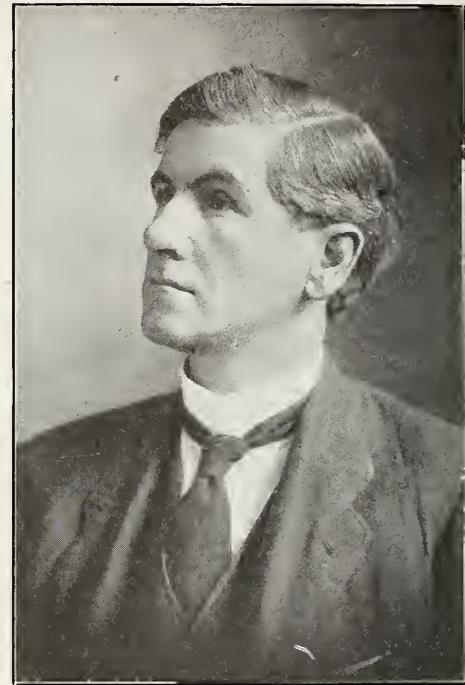
In former days the readers of almanacs demanded weather predictions, and the publishers were willing to pay celebrities a good price for them, therefore some men who knew better and were honestly struggling after a better understanding of the laws of Nature were tempted, through poverty, to supply the demand for weather predictions, and the age of superstition was kept alive long after acts of this kind were frowned upon by educated people. We do not hear of Kepler making any weather predictions after he had formulated his laws of celestial motion.

So far as known, the first clew to the rotary character of storms was obtained by Benjamin Franklin in 1747. He had made arrangements with his brother in Boston to observe an eclipse of the moon at the same time that he was observing it in Philadelphia. On the evening of the eclipse a severe northeast storm set in at Philadelphia and the sky became obscured a short while before the eclipse was scheduled to take place. Franklin thought that as the storm was attended by strong northeast winds the sky would become overcast in Boston before it did in Philadelphia and his brother also would be unable to observe the eclipse.

He was surprised to later receive a letter from him stating that the night was clear and beautiful, and that he had secured perfect observations. His brother added in the letter, as a matter of interest not connected with the eclipse, that early the next morning a severe northeast rain and wind storm set in, which was unusually destructive. To most minds this coincidence would have received only a passing thought, but to Franklin it meant more, and he immediately sent out inquiries regarding the scope and behavior of the storm. He found that at all places to the southwest of Philadelphia the storm began earlier than it did at Philadelphia, and the greater the distance the earlier it began, while it did not reach Boston until twelve hours after it had begun storming at Philadelphia.

As a result of this investigation Franklin came to the conclusion that the wind always blows toward the center of a storm and that as the center moves the wind changes. In this particular instance he concluded that the suction at the center of the storm drew the winds from the northeast while the center was a thousand miles to the southwest of Philadelphia, and that as the center advanced the winds became stronger until it had passed Philadelphia, when they shifted to the southwest and gradually subsided as the center moved farther away.

This conclusion of Franklin's was published and attracted attention, but in those days there were no telegraph lines, the mails were slow and the newspapers few, therefore, it was not until nearly a hundred years later that the clew furnished by Franklin regarding the character and behavior of storms was followed to its end and a working theory obtained that was accepted by the majority of scientists.



AUGUST WOLF

The publicity man of the National Apple Show, Spokane, Washington, who has few equals and no superiors in his line of work.

During this hundred years, especially during the last half of the period, several Americans became prominent through their discoveries and discussions regarding the circulation of the air and the forces at work in the production of storms, which were found to be large atmospheric whirls, often having a diameter of 500 miles or more, with decreasing pressure toward the center and with winds blowing spirally inward. On account of the rotary motion of the winds, these storms were called cyclones, but the same name is popularly used to designate storms of another character, which are very violent over narrow paths, and the word cyclone, meaning a large atmospheric disturbance wherein the winds blow systematically but are not necessarily destructive, has to some extent lost its original meaning.

Redfield, Espy, Loomis and Henry were the most famous of the Americans engaged during the first half of the last century in solving the mysteries of storm movements, and their work, supplemented by that of Maury, Ferrel and Dove, made possible the forecasting of the weather on a scientific basis for a day or two ahead. An analysis of the conditions causing changes in the weather has been reduced down to differences in temperature, or, in other words, without differences in temperature there would be none of the phenomena we term weather. Differences in temperature are caused by the unequal heating of the atmosphere by solar radiation, the effects of which cause differences in the pressure of the atmosphere, which in turn give rise to winds that are constantly endeavoring to equalize the differences in pressure. We thus have, as you see, a constant striving for equilibrium which is never satisfied, and wisely so, as otherwise the stagnant atmosphere would be unable to support



PACKING HOUSES IN MOSIER VALLEY, OREGON

life and our earth would soon become a barren waste.

It is generally conceded that large atmospheric whirls or cyclones originate in two ways, one of which is due to irregularities in the surface edges of masses of air moving in opposite directions, which cause vortices to form after the manner of eddies in running water. Some one of these vortices gradually becomes the dominating one and it goes on increasing in size until a storm is formed that may have a diameter of many hundreds of miles. It is probable that most of our winter storms are formed in this way. Summer storms in the temperate latitudes and all tropical storms are probably caused by convectional currents due to a considerable area of the earth's surface becoming unduly heated. This overheated air near the surface of the earth expands upward, and the upper layers flow off to the surrounding regions, which increases the pressure about the warmed area, while within the warmed area the pressure is decreased. These differences in pressure cause the lower air to flow into the warmed region, and a steady circulation is maintained. If this air moved simply as a radial inflow its velocity would be so moderate that it would not reach the violence of a storm wind, but owing to the deflection caused by the earth's rotation, these inflowing winds form a left-handed whirl in the northern hemisphere, and a right-handed whirl in the southern hemisphere, with a discharge upward that soon may become violent at the central vortex. The upward escape of warmed air which is thereby mechanically cooled to the condensing point, causes clouds, followed by precipitation which may be light or

drenching, according to the intensity of the disturbance and the amount of vapor in the air.

Where upper currents crowd together, areas of high pressure are formed and these areas are technically known as anticyclones; they have weather characteristics the opposite of low pressure areas, but their progressive movements are much the same. The air in a high pressure air is slowly descending and it must cool enough to remain at a lower temperature than that of the surrounding air in order to settle down. It, however, warms slowly by compression and the sky is generally clear in anticyclones. The surface temperatures in anticyclones are prevailingly low on account of the cooling of the ground by radiation at night, although in the day time they may be moderately high.

It is not an easy matter briefly to explain the method of making forecasts by the officials of the Weather Bureau, but the salient features of the work are here given. It will perhaps make this a little more clear if we briefly review a few matters leading up to the work of forecasting the weather on a scientific basis.

The first great event that brought to the attention of the world the necessity of establishing weather bureaus for the purpose of forecasting the weather was the storm which occurred in the Black Sea, November 14, 1854. This storm destroyed a number of ships belonging to the French, who were then engaged in the Crimean War. The Emperor of France directed the astronomer, Le Verrier, to make a study of this storm, which he did by graphic methods, finding that it came from the west and that it was



REN H. RICE

Manager of the National Apple Show, Spokane, Washington, who made good in 1909 and who will make the show this year the greatest on earth

two or more days in moving from France to the Black Sea. He reported that if its existence and course had been determined early in its progress that advance information might have been telegraphed to the fleet in the Black Sea and they could have been prepared to meet the storm, and the damage would not have been great.

Le Verrier a year or two later began a system of collecting weather reports from thirteen stations by telegraph and eleven by post, and put into practice the forecasting of the weather from the information thus gained. Other countries soon followed the example of France, and today there is not a civilized nation in the world that does not support a weather service, and most of them issue daily weather maps containing forecasts of the weather for a day or two ahead.

The United States Weather Bureau was established in 1870, and the first weather map was issued in October of that year, and they have been issued daily ever since at the central office in Washington, D. C., and the service has been extended so that a daily weather map is now issued in all the principal cities in the United States. The map issued at Washington, D. C., contains reports from about 190 stations, and the one at Portland from ninety-two stations.

Each report contains information as to the height of the barometer, the temperature, the rainfall, the direction and the velocity of the wind, the state of the weather, and miscellaneous information such as maximum winds when stormy conditions prevail, frost, thunderstorms, hail, height of water in the river, and other matters relating to the weather or to the rivers that may be of importance. These reports, as soon as received, are charted on blank weather maps. At the Portland office three sets are used.



THREE-STORY COLD STORAGE AND ICE PLANT OWNED BY THE HOOD RIVER APPLE GROWERS' UNION

This union has, besides this building, one 50x100 and one 50x200-foot warehouse

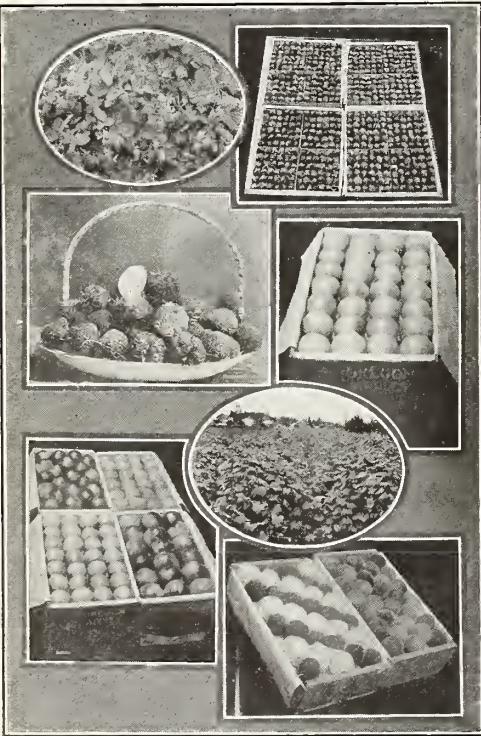
A striking illustration, the result of effective co-operation

one being known as chart A, and it contains the isobars and isotherms, as well as the other data that you are familiar with through seeing it on the printed maps.

The next chart is known as the pressure chart, and it contains lines drawn to show the twelve and twenty-four-hour changes that have taken place in the barometer readings; the twenty-four-hour changes are drawn in red and the twelve-hour changes in blue. By means of this chart the forecaster is able to obtain a bird's-eye view, as it were, of the sections of the country where the barometer is rising, where it is falling, and where it is stationary. This is very valuable information. One can tell by these changes in what section of the country the weather is likely to be controlled during the next twenty-four to thirty-six hours by a high-pressure area or by a low-pressure area, as these changes precede somewhat the formation of the high and low areas with their distinctive weather features.

The third chart shows graphically the changes in temperature by means of blue lines which inclose areas where the temperature is falling and where it is rising. Also on this chart are shown departures from the normal temperature, which is an important matter, inasmuch as a prediction of a return to normal temperature is a good rule to follow when the departures are great and the temperatures at the surrounding stations do not indicate a continuation of the abnormal conditions where they are now prevailing.

As soon as these charts are prepared, which generally takes about half an hour, the forecaster makes his deductions from the data they contain as to what the weather will be during the next thirty-six hours and dictates them to an assistant, who makes as many copies as are



COMMERCIALLY PACKED PEACHES, APPLES AND PRUNES, BENTON COUNTY, OREGON

BETTER FRUIT

needed, after which a brief statement of the conditions that have prevailed during the preceding twenty-four hours is prepared for the printer.

Copies of the forecast and of the synopsis are printed with the weather map and given to the newspapers, and thus circulated in a very short time where anyone who cares for the information can readily obtain it.

It would be a simple matter to foretell the weather if the area to the west, where the changes are taking place, were outlined in detail, and the whole system continued to move regularly in the same direction as when first observed, but unfortunately atmospheric disturbances while having a good deal of law and order about them, undergo modifications both in direction and intensity as they advance eastward, and skill in forecasting comes only after long experience gained in studying the behavior of past disturbances and being able through the knowledge thus obtained promptly to draw correct conclusions when similar conditions appear again.

I believe that there is not another weather bureau in the world that can



BOX OF WOLF RIVER APPLES
Grown by John Ashenfelter, Montrose, Colorado
thirty-six apples to the box.



compare with the United States Weather Bureau in organization, efficiency and accuracy, notwithstanding which we fall short of the exacting demands made upon us by the public. There has been no material improvement in the accuracy of the forecasts in the last ten or fifteen years, and there will be none in the next ten or fifteen years unless some new discoveries are made regarding the behavior of the atmosphere in regions we now know nothing about, and these discoveries can be put to practical use in the making of forecasts.

It is the failures to predict minor changes in the weather that cause so much unfavorable comment, but when it is considered that more than four out of five of the daily forecasts are correct every man of intelligence realizes that work is being done on scientific principles and the "weather man" does something besides guess at the weather. Every mistake is widely published, and one mistake attracts more attention than a dozen good forecasts.

It is not uncommon for the local weather official to be asked what the weather is going to be for a month or two ahead, or what, if any, change is expected at a particular hour of the day,

and neither of these questions can be answered with any degree of precision. Forecasts for a longer period than two or three days can only be given in general terms, and then only when the conditions are known over a wider area than the United States and they are exceptionally favorable in the way of indicating changes in the weather. On the other hand, it is impossible to give details as to the hour when a change in the weather will take place, and the best the Government forecasters can do is to try and locate changes within periods of twelve hours each. In other words, if rain is predicted, the twelve-hour period in which it is expected to fall must be given, and any rain falling in that period justifies the forecast. Some failures are charged to this endeavor to confine the expected change within such narrow limits, and the rain or fair weather may occur in the next twelve hours instead of coming during the period placed by the forecaster. ♦ ♦ ♦

The following is a list of the big apple shows which will be held this year, and every one of these shows in all probability will be at least 10,000-carload displays. These shows are very educational and every apple grower, yes, every fruit grower, should make it a point to attend at least one of them, the one in which he is most interested, and if possible, more than one. The editor knows whereof he speaks, as he has been a regular attendant to the National Apple Show at Spokane every year, and he has learned more about the apple business from every point of view at these apple shows and the amount of information acquired at each apple show has been of inestimable value. Excursion rates will, in all probability, be made on all railroads. The following is the list to date:

Albany Apple Show, Albany, Oregon, November 9 to 11; Western Montana Apple Show, Missoula, October 10 to 15; California Apple Show, Watsonville, October 10 to 15; National Apple Show, Spokane, Washington, November 14 to 19; Canadian National Apple Show, Vancouver, B. C., October 31 to November 5; Donaldson Fruit Exposition, Minneapolis, October 31 to November 10; National Horticultural Congress, Council Bluffs, Iowa, November 10 to 17; Oregon Apple Show and Horticultural Society, Portland, November 30 to December 2; United States Land and Irrigation Exposition, Chicago, November 19 to December 4; National Irrigation Exposition, Pueblo, Colorado, September 26 to 30; National Land and Irrigation Exposition, Pittsburgh, October 17 to 29.

All prize carloads and prize-winning exhibits of the National Apple Show, at Spokane, will be on exhibition at the Armory Building, at Chicago, November 28 to December 3.

A NEW FOE FOR THE CODLING MOTH DISCOVERED

A PARASITE which feeds upon the destructive codling moth, has been discovered by Professor E. P. Taylor, a horticulturist in the Grand Valley of Colorado, and if the discovery is properly followed out spraying for that dreaded pest may no longer be necessary.

His discovery will be of much interest to the orchardists all over the United States, for the Grand Valley is by no means alone in its sufferings from the codling moth.

Taylor originally discovered the parasite four years ago, but only this year has it begun to do effective work, when it has developed sufficient numbers to become a positive relief from the ravages of the codling moth.

Efforts will probably be made in the Grand Valley to propagate the parasite on a large scale, with the hope that the danger of the codling moth may be eliminated forever.

Professor Taylor, in describing the discovery, says: "If Grand Valley ranchers will but look close enough they will see something taking place in their orchards these days that will give them much for which to be thankful.

"This season, so hot and dry, has proven one of the most favorable for codling moth development in recent years, but the growers on the other hand have put up such a desperate fight by spraying, that the crop will be an extremely creditable one, upon the whole, after all.

"For several weeks a tiny bee parasite has been coming to the rescue of the orchardist in the codling moth campaign. This little bee feeds upon the egg of the moth, being so small as to develop by twos and threes in a single codling moth egg, and the codling moth egg is smaller than a common pin head. The bee is so small that eighty-three, placed end to end, would extend but one inch. They can scarcely be seen with the naked eye, even the closest scrutiny making them appear as mere specks of reddish brown dust. Magnified, they will be seen to have four pretty, transparent wings, veined and clothed with rows of fine hair, reddish eyes and brownish legs, body and antennae. They jump or fly so quickly as to make their movements invisible.

"These little bee friends began their work in the orchards this summer about June 19. At least on that date in the orchards of H. O. Kisor, of Clifton, and J. H. Pettingill, east of Grand Junction, I discovered some codling moth eggs which, instead of showing their characteristic healthy appearance, seemed

blackened throughout, and in some cases these blackened eggs had already yielded tiny bee parasites through small round holes on their upper surfaces. The next day I found on Orchard Mesa twenty eggs black from parasitism, some of which had already yielded their tiny bees. One lead was found with four infested eggs. On a single branch, out of eleven eggs counted, ten were blackened. A few days later a count in orchards in the direction of Fruita showed as high a percentage of damaged eggs. On August 2 fully forty affected eggs were found in the L. K. Davis orchard northeast of town. On the same afternoon in the Knowles orchard, toward Clifton, on low, or trees bearing few fruits, a remarkably high percentage of damaged eggs were found. Out of 170 eggs counted by George P. Weldon and myself, 154 were found to be blackened by the parasite, and only sixteen were of normal appearance. In other words, only 9.4 per cent of the eggs upon the tree were of healthy appearance, and some of these kept under observation since collected, have developed the characteristic parasitized color. About a single apple, either upon its sides or upon leaves, borne nearby, twenty-three cod-

good. That the parasite has increased this year over its former numbers I am quite sure. I first discovered the bee in Western Slope orchards in 1906. Blackened



eggs were collected and bees reared—in one case three bees emerging from a single egg. In the summer of 1907 a few were also discovered, but they were by no means as abundant as this year.

"The benefit thus far has come principally during the latter period of second brood codling moth eggs, but this benefit is going to be appreciable for the balance of the season, and the influence of the parasite will unquestionably be felt the following year. If, by natural or artificial means, these miniature bees could be induced to begin their work upon the first brood of eggs, as they have upon the second brood of eggs this year, spraying for codling moth worm would become a forgotten art.

"The species is not new, having been first discovered by Professor Comstock in the South in 1878, as a parasite upon cotton worm eggs. Mr. Riley, the government entomologist, gave the insect the name 'Trichogramma pretiosa,' in 1879."

The codling moth has been unusually active in Grand Valley this year, due in a large measure to the hot, dry weather. The orchardists, however, are determined not to allow the pest to conquer them, and some have sprayed three and four times already this season.

◆ ◆ ◆

BETTER FRUIT is planned out for the future to continue to be an improvement over the past, and the editor, from the recent trip made throughout the Eastern fruit growing sections, where he traveled perhaps five hundred miles in automobiles, wagons and buggies through the fruit growing sections, feels that now "Better Fruit" is in better position to be strengthened and made more valuable to the fruit grower than ever before. On account of the accumulation of work during the editor's absence of five weeks, and his attention at the present time being devoted to the harvesting of his own apple crop, the editor has found it impossible to get time to write articles on a number of subjects which will be interesting to fruit growers. However, in the future we will furnish our readers some articles, editorially and otherwise, which will be beneficial in many ways.

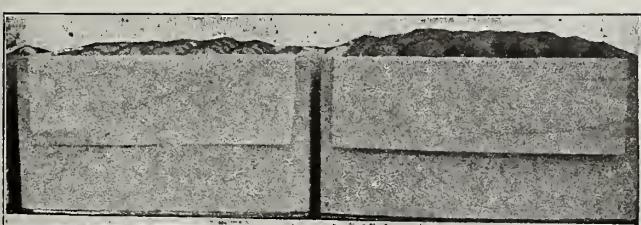


FRUIT PACKING HOUSE AT CORVALLIS OREGON

ling moth eggs were counted which had been blackened and destroyed by this parasite. Not a single sound egg was found in this case. Eleven parasitized eggs were found upon a single apple, and six upon a single leaf.

"This sly little bee searches out a freshly laid codling moth egg, pierces the upper shell with its ovipositor, depositing its eggs within the tissue of the egg. The eggs of the parasite hatch in about forty-eight hours, and the bee larvae proceed to devour the contents of the codling moth egg, causing it to turn to the unnatural black color. After grown the bee cuts an aperture through the outer shell and emerges as a microscopic, but full-fledged bee.

"This condition of parasitism is quite general throughout the Grand Valley at this time, and is doing great



TWO BOXES OF APPLES, ONE PACKED WITH THE RIGHT SWELL AND THE OTHER TOO HIGH

BETTER FRUIT

HOOD RIVER, OREGON

OFFICIAL ORGAN OF
THE NORTHWEST FRUIT GROWERS' ASSOCIATION
A MONTHLY ILLUSTRATED MAGAZINE
PUBLISHED IN THE INTEREST OF MODERN
FRUIT GROWING AND MARKETING
ALL COMMUNICATIONS SHOULD BE ADDRESSED AND
REMITTANCES MADE PAYABLE TO

Better Fruit Publishing Company

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IN ADVANCE, IN UNITED STATES AND CANADAFOREIGN SUBSCRIPTIONS, *Including Postage*, \$1.50

ADVERTISING RATES ON APPLICATION

Entered as second-class matter December 27, 1906,
at the Post Office at Hood River, Oregon,
under Act of Congress of March 3, 1879.THE BIG APPLE SHOWS AND
THEIR HISTORY

THE importance of the apple displays and apple shows that are being held throughout the Northwest this year are of inestimable value to the Northwest as an apple growing country. These displays are the outgrowth of the rapid development of the Northwest as a fruit country, and this growth might be properly set down as evolution. These apple shows have attracted thousands of people from all over the United States to the different cities where they have been held and the publicity obtained has been an important factor in interesting many homesekers to come to the Northwest. Consequently a little history on the subject may be of interest to our readers.

To the Oregon State Horticultural Society belongs the credit of making the first display of any importance of apples packed in boxes, which could be called a general display, apples being exhibited from various sections of the State of Oregon. Of course many previous displays had been made in various localities and by various associations, but on plates. The Oregon State Horticultural Society made the first display of boxed fruit in 1904. This display consisted of only a few boxes, but box displays rapidly grew in popularity and magnitude, and during the last three years the exhibit has averaged about three hundred boxes. To Hood River Valley, however, belongs the credit for making the first display of fruit in boxes, at least

of any importance, and certainly the credit for making the first display of apples packed in boxes where a large number of boxes were exhibited. In the year 1902 the display at Hood River was probably about 300 boxes, in 1904 about 600 boxes, in 1906 about 800 boxes, and in 1908 and 1909 about two carloads in each year. But all of these shows were to a certain extent local, and the credit for pulling off the first apple show that was national in significance and large in size belongs to Spokane, Washington, the first National Apple Show being held in that city in 1908, where about ten carloads were placed on exhibition. In 1909 the National Apple Show held at Spokane assumed magnificent proportions, having on display about sixteen carloads. Montana came through in 1909 with a good apple show held at Missoula, and the same year Colorado followed with a National Apple Show held in Denver, consisting of about ten carloads. But this year is the year of all apple shows. The Spokane Apple Show will, as usual, probably be the largest and contain an exhibit of about twenty carloads. California for the first time is pulling off a big apple show at Watsonville, which will contain a large number of carload exhibits. British Columbia is falling in line and will hold the first Canadian Apple Show at Vancouver, and we are advised that space has been engaged for thirteen carloads. All of these shows will not only do all the districts in which they are held an immense amount of good in an educational way, but will be of unlimited benefit to the entire Northwest.



APPLE PACKING SCHOOLS

PERHAPS nothing that has been done for the education of the fruit grower has been of greater value than the packing schools, and a few words along this line naturally ought to be of interest.

When the editor took the management of the Hood River Apple Growers' Union in 1904 he found that they had but eight packers that were really experienced men to begin with. With the assistance of these eight men the editor developed a packing crew of about eighty during the next three years, but this number was not sufficient to handle the crop, and the first packing school was held in 1907 under the auspices of the Hood River Apple Growers' Union, Mr. Huxley being at that time manager. In the year 1910 was held the largest packing school and the most successful ever pulled off by the Hood River Apple Growers' Union, under the direction of Manager C. H. Sproat, in which two hundred packers were taught the art. Young men have come from all sections of the United States to learn the Hood River method and Hood River pack.

Other districts quickly followed along in this line of work, and in 1909 Walla Walla held a packing school in the Y. M. C. A. building, and this packing school was in charge of a Hood River expert. Wenatchee and Yakima also held packing schools the same year for the purpose of increasing the number of packers necessary to handle their crops. This year these packing schools are being held

in a number of different districts. In the year 1908 the National Apple Show held a packing school, which was managed by Professor C. A. Cole, assistant to Professor C. I. Lewis, of the experiment station of the Oregon Agricultural College, Corvallis. In the year 1908 J. B. Castner of Hood River spent six weeks demonstrating the Hood River pack to the staff and students of the Oregon Agricultural College.

CREDIT TO WHOM CREDIT
IS DUE

IN JULY, 1906, the first edition of "Better Fruit" was printed, consisting of twenty-four pages and four thousand copies. In September of the same year "Better Fruit" published the first special edition on packing boxed apples, splendidly illustrated with valuable articles on how to put up a pack. In 1907-08-09-10, in the month of September, "Better Fruit" consecutively published a splendid packing edition. Every one of these editions have been masterpieces on this subject. A good pack and quality are absolutely necessary in securing good prices for the fruit grower. If there is one feature of the fruit growing business that "Better Fruit" has considered more important than another it is clean grading and quality pack. We have been preaching this for nearly five years.

"Better Fruit" is the first horticultural journal, or the first paper of any kind, that took up the subject of box packing, giving complete articles on how to put up a pack and thoroughly illustrating the same in a practical way. Mike Horan, who won the first carload exhibit at the Spokane National Apple Show in 1908, informed the editor that he used up several editions of the special packing number of that year in putting up his winning car. Many other winning exhibitors at the Spokane National Apple Show have voluntarily informed the editor that the packing number of "Better Fruit" had been their guide in packing, and I might say that many a fruit grower writes or tells us that "Better Fruit" is his fruit bible.

In the year 1906 Professor L. B. Judson issued the first bulletin that was ever put out by any experiment station on packing apples in boxes. Professor Judson spent a week at the home of the editor, who was then manager of the Hood River Apple Growers' Union, and it was a great pleasure to the editor to have Professor Judson accompany him on his tour through the orchards inspecting and superintending the pack, and much of the information and many of the photographs shown in that bulletin were obtained during his visit in Hood River.

Professor C. I. Lewis, horticulturist of the Oregon Agricultural College, issued the next bulletin ever issued by an experiment station on packing apples in boxes. This bulletin was very thorough and very complete and very practical, and certainly was a great help to the fruit grower, and Professor Lewis is entitled to much credit for the excellent article on this subject.

A great many journals are now following the ideas of "Better Fruit," the

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originator. Some are covering themselves with a whole lot of glory in articles on packing, and many of them are indicating that they are original in this line of work, or failing to give credit so that such would be the reader's conclusion. Many horticultural papers have followed in this and other lines of work originated by "Better Fruit" and secured articles from previous correspondents and writers for "Better Fruit," hoping to profit by the experience and observation that these men have gained in Hood River and through the columns of "Better Fruit." Other horticultural publications may do a lot of claiming, but a reference to the files of any publication in comparison with "Better Fruit" will show that in 1906 "Better Fruit" published the first special packing edition, containing good articles on how to put up a box pack and well illustrated, and each year since has published a better special packing edition—and now the others are just beginning on this line of work.

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THE NORTHWEST'S APPLE CROP

LAST year "Better Fruit" published an estimate of the apple crop of the Northwest, and for that estimate was promptly accused by the trade of underestimating. The editor immediately wrote those people who had seen fit to criticize him by correspondence that he still believed the estimate was approximately correct and saw no reason for changing it. It was great satisfaction when the season was over to have these same peo-

ple who had criticised "Better Fruit" for underestimating voluntarily write us and admit that our estimate turned out to be the most reliable that had been given. Most of the estimates given by the Agricultural Department and the National Apple Shows are given in percentages. Most horticultural papers use percentage basis. "Better Fruit" was the first publication to give an estimate that definitely stated the total number of carloads in each district. It was our intention to prepare such an estimate for this year, but on account of being East on important business in connection with the fruit situation and other personal matters, the editor regrets to state that he has been unable to get the estimate in a sufficiently satisfactory condition to give the definite quantity for each district. We hope in the November or December editions to give some further information along this line. The following figures might properly be called a guess on the quantity: Washington will ship this season probably 4,000 carloads; Oregon will ship around 2,000 carloads; Idaho will ship about 1,500 carloads; Montana will ship about 200 carloads; Colorado will probably ship 2,000 carloads, and California will probably ship 4,000 carloads, making in all 14,000 carloads from the box apple districts. This is not very different from the number of carloads shipped from these same states last year, as a whole. However, we desire to call the attention of the reader to the fact that Oregon, Washington and Idaho have a much larger crop than last year, while Colorado has a smaller crop than last year.

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Cherries	\$10-\$20 per tree	Strawberries	\$300-\$450 per acre
Transcendent Crabs	\$500-\$1,200 per acre	Blackberries	\$300-\$400 per acre
Plums	\$5-\$10 per tree	Currants	\$200-\$300 per acre
Pears	\$800-\$1,500 per acre	Carrots	1,000-2,000 bushels per acre
Oats	60-100 bushels per acre	Potatoes	200-600 bushels per acre
Wheat	40-60 bushels per acre	Hay	3/4 ton per acre
Alfalfa	4-5 tons per acre	Sugar Beets (experiments on Daly ranch)	16.9 tons per acre
			Sugar percentage, 19.64.

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WHY AND HOW SMOKE WILL SAVE FRUIT CROPS

BY DR. LUESTHER AND MOIZ, ROYAL INSTITUTE, GERSENHEIM, GERMANY, IN THE WORLD-WIDE FARMER

THE knowledge of the effectiveness of smoke as a preventative for frost is very old, but the knowledge of the factors combined to make it such is the result of comparatively recent investigation. For a long time the opinion was general that smoke acted in a manner similar to that of the clouds, which early had been recognized as exercising a preventative influence against frost. Even at this day it is believed that clouds and smoke are only effective inasmuch as they prevent radiation of

heat from the earth. Viewed from the standpoint of effect this theory is correct, but the processes taking place do not coincide with the premises upon which the theory is based.

The earth radiates the same amount of heat, no matter whether the sky is lined with clouds or not. A layer of clouds will absorb a large portion of the heat radiated in its direction by the earth and, in return, will, by reflecting it, let the earth benefit from this heat. On the other hand, clouds sometimes possess a

relatively large heat of their own which, by radiation during the night, is absorbed by the earth. Especially is this the case in the spring of the year.

An atmosphere charged with steam has the same effect as the clouds. In this case, too, the reflection of the heat absorbed will counteract an excessive cooling off of the ground. Added to this is the fact that when the air charged with steam becomes cool, the steam changes to water, and, in the shape of dew, settles on plants and other objects. By

Irrigated Orchard Tracts **Rogue River Valley**



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Portland Commercial Club Portland, Oregon

this change a great amount of heat is released. This heat, to a certain degree, protects the bedewed portions of the plants against a too far-going cooling off.

Somewhat different are the conditions encountered with artificial smoke clouds. These clouds, first of all, consist of small particles of soot suspended in the atmosphere. Soot, to a high degree, possesses the power to radiate heat. The heat radiated from the earth, therefore, is absorbed by the smoke and a part of it is carried back to it. Such a thing as the smoke giving to the earth any heat of its own need not be considered as the heat of the soot is so small that it can be ignored altogether. The heat generated by condensation, too, is so very small. Its amount is in proportion

to the quantity of steam contained in smoke.

Besides the small particles of soot and steam several other factors, for instance, ammonia, are to be considered in connection with the absorption of heat. One must always consider, however, that a layer of smoke can only have a noticeable protecting influence if it is sufficiently dense and of sufficient height.

The power of the various substances of absorbing heat varies as the following table, by Tyndall, will show:

Air	1
Carbonic acid	90
Sulphuric acid	710
Oil forming gas	970
Ammonia gas	1195

The effect of ammonia gas, which possesses the power to absorb heat to a

marked degree, is already noticeable when this gas is contained in the air in quantities that can scarcely be measured. This easily explains the favorable results obtained with smoke produced by the burning of stable manure. The effect of tar smoke can partly be traced to the fact that it contains ammonia gases.

Anything and everything that produces sufficient smoke may be used for smudging. Weeds, dry potatoe and bean vines, refuse and so on, may be used, either alone or with coal tar added to them. In France stable manure, sprinkled with coal tar and packed into sacks, was used with success. Without doubt this material is very effective as the steam generated, as well as the ammonia gases, especially the latter,

JAMES J. HILL SAID OF

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If you live here the union will pack your fruit like this, and will place it in the big markets of the world.

And The Hood River District Land Company will sell you the land on the best terms possible and at the most moderate prices.

Communicate with us. Smith Block, Hood River. Long distance telephone 175

ANYTHING FROM RAW LAND AT \$50 AN ACRE TO A FULLY DEVELOPED ORCHARD
AT PRICES WHICH WE WILL QUOTE YOU UPON APPLICATION

greatly weaken the cooling off of the air, but its use is only possible where stable manure can be had cheaply.

In California and Hungary, "steam-smoking" is used frequently. Either water is made to evaporate in iron pans or coal fires are sprinkled with water. Another method is to build fires in excavations dug twenty inches deep and about one hundred yards apart, and place over them on timbers, wet bundles of straw. These are kept from burning by constant moistening.

In many quarters the opinion prevails that by the burning of moist materials the danger of frost is increased, inasmuch as the moisture settles down upon the plants, but this belief, in our opinion, is without foundation. No reasons can be

advanced for its correctness. On the contrary, one is forced to believe the opposite if one considers the physical processes taking place.

A moist smoke will settle at a lower altitude than a dry smoke because the rising power of smoke saturated with steam is smaller by reason of its weight. When moist materials are burned a large part of the heat is absorbed as the water is changed into steam. As the steam becomes condensed in the shape of tiny drops of water on the parts of plants, this heat is freed again and the plants receive its benefit.

The air rising in the vicinity of smudges creates there a weak air current, which causes a mixing of the upper warm-air strata and the lower cold-air

strata. By this mixing of the air a certain protection against frost is produced. The cold air collects at the deepest points and the warmer air gathers above it. If, by any agency, the collecting of the cold air near the ground is prevented by the constant mixing with the warmer air, then harmful temperatures in any will be rare occurrences. This fact explains that on windy nights there is no danger from frosts.

Coal tar as fuel produces the densest smoke. For that reason it is used most extensively, notwithstanding the fact that its handling is troublesome, that it must be stirred up very often and that it burns too quickly. Burning of tar in excavations has been found to be impracticable for the reason that too much tar

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\$800 PER ACRE

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Hood River Ortley

seeps into the ground. The use of iron pots is better, but still better, and producing much more smoke, is the smudging apparatus known as "Qualm." It develops and unusually thick smoke, thereby saves smudging material and fire places, is durable and can easily be transported when the wind changes, even though it should be in use.

The question when smudging should be done is discussed by Mueller-Thurgau as follows:

It does not recommend itself to wait until the parts of the plants are cooled

off to thirty-two degrees Fahrenheit. One must keep in mind that smudging cannot protect against cold in general, but only against the so-called radiating frosts, against over-cooling by radiation. Smudging cannot completely prevent cooling off but can only retard it. Therefore, the earlier smudging is begun the better will be the result. During the night the cooling off steadily progresses and gradually the temperature of the air also decreases.

Therefore, the time before sunrise, as a rule, is most dangerous. One must con-

sider this fact in smudging by continuing until the temperature of the air begins to rise, that is, until after sunrise. It seems as if most failures are due to the fact that the smudging was begun too late.

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ACCORDING to an experiment by the Colorado Station, apple blossoms, when the buds show pink, will stand twenty degrees above zero, and when in full bloom will endure twenty-six degrees. Pears endure about the same cold as apples, and peaches in full blossom, are not injured below twenty-eight degrees. Some growers of the State criticise the station findings, and claim that under some conditions apples were liable to be blighted at temperatures not below twenty-nine degrees.—Philadelphia Record.

Earl Wood J. W. Merrifield Geo. L. Robinson

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THAWING FRUIT BUDS

A WRITER on fruits and frosts says: "It is not the actual freezing of the buds that destroys them, but the rapid thawing. Smudging is used to keep the early morning rays of the sun away from the buds so they will have an opportunity to thaw out gradually. If this action is taken promptly, fruit may be saved even after it has been covered with a coating of ice. It is claimed that orchards may be heated for about two dollars an acre a night."

Professor E. R. Lake, in the Oregon climate and crop bulletin, makes the following statement relative to the injuring of plants by frost:

"Low temperature congeals the watery parts of the cell sap and also the intercellular water contents of the plant. Within certain limits this is not or may not be injurious, providing the protoplasmic contents of the cell are able to absorb the water, and do this before the cell structure collapses as a result of insufficient cell turgor. Frequently the frosting of plants is followed by a sudden rising of temperature, in which case much of the water which was part of the cell sap in the normal condition of the plant escapes through the cell wall into intercellular places, or even from the plant entirely, and thus, the protoplasm of the cell, being unable to assume its normal condition, becomes disorganized and decomposition follows."

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early morning between the sun's rays and the frosted fruit. With flowers and garden truck this can be much more easily accomplished than with fruit. In this respect the gardener has a decided advantage over the orchardist."—North Yakima Republic.



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A booklet illustrating the resources of this district will be sent free on applying to the PUBLICITY DEPARTMENT of the ASHLAND COMMERCIAL CLUB, ASHLAND, OREGON.

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TEN AND TWENTY ACRE TRACTS

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The elevation of this land is 1,200 to 1,700 feet, and 250 to 300 days of sunshine guarantees the high color of the fruit grown in this beautiful valley. Seventy-five per cent of every tract is ready for cultivation.

We have just finished planting sixty-five acres, and wish to continue the development of this property, and will for this reason sell thirty ten-acre tracts for \$125 per acre, this price to include a perpetual water right for the complete irrigation of the purchased land. Payments to be made half down and the balance in one or two years, with eight per cent interest on deferred payments. These lands have been passed upon by the Washington Horticulturist as being as high grade apple land as there is in the state. For descriptive article see another page of this edition.

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THE NORTHWEST ASSOCIATION OF NURSERYMEN

Oregon—Albany Nurseries, Albany; A. Brownell, Portland; Sunnyslope Nursery Company, Baker City; Carlton Nursery, Carlton; A. McGee, Orenco, M. McDonald, Orenco; H. S. Galligan, Hood River; Tune-a-Tune Nursery, Freewater; pany, Carlton; J. B. Weaver, Union; S. A. Miller, Milton; G. W. Miller, Milton; C. B. Miller, Milton; F. W. Power, Portland; J. B. Pilkington, Portland; C. F. Rawson, Hood River; F. W. Settemier, Woodburn; F. H. Stanton, Hood River; E. P. Smith, Gresham; W. S. Sibson, Portland; Sluman & Harris, Portland; C. D. Thompson, Hood River; H. A. Lewis, Portland; Sunnyslope Nursery Company, Baker City.

Washington—C. J. Atwood, Toppenish; J. J. Bonnell, Seattle; A. C. Brown, R. D. 2, Selah; Ed Dennis, Wenatchee; A. Eckert, Detroit; D. Farquharson, Bellingham; George Gibbs, Clearbrook; W. A. Berg, North Yakima; Interlaken Nursery, Seattle; Inland Nursery and Floral Company, Spokane; Rolla A. Jones, R. D. 1, Hilliard; A. Lingham, Puyallup; G. A. Loudenback, Cashmere; A. W. McDonald, Toppenish; C. Malmo, Seattle; C. McCormick, Portage; W. S. McClain, Sunnyside; T. J. Murray, Malott; G. W. R. Peaslee, Clarkston; Richland Nursery Company, Richland; J. A. Stewart, Christopher; C. N. Sandahl, Seattle; F. K. Spalding, Sunnyside; H. Schuett, Seattle; A. G. Tillinghast, La Conner; Wright Nursery Company, Cashmere; F. A. Wiggins, Toppenish; C. B. Wood, R. D. 2, Selah; C. N. Young, Tacoma; E. P. Gilbert, Spokane; Stephen J. Hermeling, Vashon; Northwest Nursery Company, North Yakima; H. C. Schumaker, Brighton Beach; E. P. Watson, Clarkston; Yakima Valley Nurseries, Toppenish; Yakima-Sunnyside Nurseries, Sunnyside.

California—John S. Armstrong, Ontario; F. X. Bouillard, Chico; J. W. Bairstow, Hanford; Chico Nursery, Chico; Leonard Coates, Morgan Hill; California Rose Company, Los Angeles; California Nursery Company, Niles; Charles A. Chambers, Fresno; L. R. Cody, Saratoga; R. P. Eachus, Lakeport; A. T. Foster, Dixon; E. Gill, West Berkeley; C. W. Howard, Hemet; William C. Hale, Orangehurst; William Kelly, Imperial; James Mills, Riverside; S. W. Marshall & Son, Fresno; John Maxwell, Napa; C. C. Morse & Co., San Francisco; Fred Nelson, Fowler; Park Nursery Company, Pasadena; George C. Roading, Fresno; Ruehl-Wheeler Nursery, San Jose; Silva & Bergtholdt Company, New Castle; G. W. Sanders, Davis; Scheidecker, Sebastopol; W. A. T. Stratton, Petaluma; R. M. Teague, San Dimas; T. J. True, Sebastopol; J. B. Wagner, Pasadena; W. F. Wheeler, Oakesdale; Edwin Gowler, Fowler;

Hartley Bros., Vacaville; Thos. Jacobs & Bros., Visalia.

Alabama—W. F. Heikes, Huntsville.

British Columbia—F. R. E. DeHart, Kelowna; M. J. Henry, Vancouver; F. E. Jones, Royal Avenue, New Westminster; Richard Layritz, Victoria; Riverside Nurseries, Grand Forks; Royal Nurseries & Floral Company, Vancouver.

Colorado—J. W. Shadow, Grand Junction.

Idaho—Anton Dietrichsen, Payette; J. F. Littooy, Mountain Home; O. F. Smith, Blackfoot; Tyler Bros., Kimberly; J. C. Finstad, Sand Point; C. P. Hartley, Emmet; J. A. Waters, Twin Falls. Montana—Montana Nursery Company, Billings. New Hampshire—Benjamin Chase Company, Derry Village.

New York—Jackson Perkins Company, Neward; McHutchinson & Co., New York; Vredenberg & Co., Rochester.

Pennsylvania—J. Horace McFarland Company, Harrisburg.

Tennessee—Southern Nursery Company, Winchester.

Utah—Harness, Dix & Co., Roy; Orchardist Supply Company, Salt Lake; Pioneer Nursery Company, Salt Lake; Utah Nursery Company, Salt Lake; Davis County Nursery, Roy.

♦ ♦ ♦

FRUIT Inspector J. J. Beebe, for Lane County, Oregon, head-quarters at Eugene, reports spring plantings of orchard trees at 112,000. Of these, 75,000 were apples and the remainder were walnuts, cherries, pears and peaches.

FOR SALE 144 acres of land in Upper Hood River Valley, suitable for fruit. Four miles from Parkdale station; under the new Glacier ditch; five acres cleared; situated on stage road to Mount Hood; good cabin and barn. \$65 per acre; terms.

John Goldsbury, Parkdale, Oregon

G. Y. EDWARDS & CO.

HOOD RIVER, OREGON

Our Specialties:

Fruit Lands, Orchards and Raw Lands

Get our literature and list of orchards

WRITE US FOR PARTICULARS

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT





PATENTED

ATTENTION APPLE GROWERS—ORCHARD HEATING BY The BOLTON ORCHARD HEATER

Here are a few reasons why you should guarantee yourself a full crop by using our heaters: They raise the temperature 10 degrees; they can be lighted rapidly; they can be put out quickly if necessary; they burn over seven hours and use only one gallon of oil; they produce no soot; they only cost \$2.00 per acre for fuel; they will last for five seasons; they are endorsed by the California Fruit Exchange; they absolutely insure your crop against frost.

The following is copied from P. J. Dreher's annual report to the stockholders of the San Antonio Fruit Exchange:

"Frost Protection — The BOLTON ORCHARD HEATERS are recommended by a committee of the exchange after two severe tests. Don't delay the matter of securing your supplies NOW. Don't run the risk of losing dollars when a few cents invested gives you ample protection for years to come. ACT NOW!"



THE ABOVE CUT SHOWS OUR HEATERS IN USE

Fruit Exchange Indorsement:

F. Q. Story, President
P. J. Dreher, First Vice President
W. G. Fraser, Second Vice President
B. A. Woodford, General Manager and Secretary

R. H. Wilkinson, D. C. King, T. H. Powell, Sales Managers
E. G. Dezell, Assistant to General Manager
J. L. Merrill, Cashier
A. D. Fraser, Claim Manager

CALIFORNIA FRUIT GROWERS' EXCHANGE

A. F. Call, Attorney

P. O. Address, Box 566, Station C
Los Angeles, California, August 31, 1910.

All Stockholders:

In view of the large damage by frost during the last two seasons, the Supply Company has made investigations of the various methods of orchard heating, and some time ago appointed a committee consisting of F. Q. Story, W. G. Fraser, P. J. Dreher, A. F. Call and W. C. Hendricks to investigate the matter and make a report.

The report of this committee has been received, and they unanimously recommend the adoption of the "Bolton Orchard Heater," which is flaring in shape, with carbureting and air passages, and soot arrester to regulate combustion and arrest the soot, and with a cover to protect against water.

This heater burns the refinery residuum, which is the ordinary California crude oil, with the asphalt, gasoline and kerosene extracted, and which sells at about 90 cents a barrel at Los Angeles.

The committee report that it is their judgment, and the judgment of those who have witnessed the demonstrations, that this is the best and most efficient heater on the market, and that its points of superiority are: the fuel economy, the length of time that they burn, the small amount of soot given off, and their effectiveness in giving out heat.

These pots, when loaded with five quarts of residuum, will burn for eight hours, and placed one hundred to the acre at intersections, with double protection on the windward side, will on ordinary cold nights protect fruit from freezing.

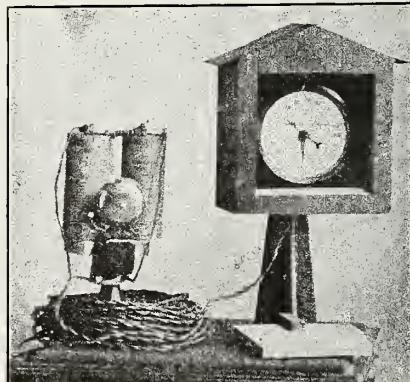
Inasmuch as the factory capacity for this pot is limited, it is desirable for all those who wish to place orders to do so at once, so that the manufacturing may be commenced as early as possible. It is estimated that \$2.00 an acre per night will cover the fuel cost for these pots, and at this nominal expense every association orchard should be protected.

The manufacturers agree to guarantee that the pots will last for five years, if their directions as to care and protection are followed.

The demonstrations for this pot have been made at Pomona and Corona, where the principal growers can give further information to all those desiring it. Yours truly,

FRUIT GROWERS' SUPPLY COMPANY.
A. E. Barnes, Secretary.

Price of Heater is 20c f. o. b.
Price of Thermometer \$22.50
Complete



Bolton Electric Frost Alarm Thermometers automatically ring the bell in your house and will give you ample warning of approaching frost

The Frost Prevention Co., Manufacturers, 218 Haight Street, San Francisco, Cal.

FRUIT IS AMPLY PROTECTED FROM FROST INJURY

THE growers of this district have taken a decisive stand in regard to the question of preventing frost damage to fruit. At the annual meetings of the growers held recently at the Indian Hill and Fairmount packing houses, T. P. Bolton, the frost fighting expert of Fresno, California, and F. W. Krone, president and general manager of the Frost Prevention Company, of Fresno, California, made short addresses covering the vital features of this all important topic.

It has been amply demonstrated that the fruit crops of the Pomona district can be protected from frost and freezes. We must admit that we are subject to damage by frost here in certain groves, though perhaps in a less degree than other sections, and that if we desire to maintain the best standard of value for our land and a high standard of quality in our fruit in the markets of the country, our fruit must be sent to the consumer free from the damaging effects of frost. A small consignment of frost-damaged fruit constitutes a great menace to the welfare of our whole district and rigid scrutiny should be exercised to prevent shipment of frost-damaged fruit. To take steps for the prevention of frost damage is just as logical and reasonable as to take out a fire insurance policy or to take precaution against any other catastrophe or damage, and it is gratifying to note that it is the consensus of opinion among up-to-date growers today that a frost prevention outfit is the necessary part of an orchard's equipment, and of greater importance than spraying, fumigating or pruning tools.

The Fruit Growers' Supply Company has recommended and endorsed the Bolton orchard heater, which has been thoroughly tested and has proved

its worth in most of the fruit sections from the Atlantic to the Pacific, as well as right here at our doors.

Owing to the fact that a large percentage of our growers have signified their intention of installing these heaters within the next ninety days, the supply company has been enabled to lower the manufacturing prices very materially, thus securing to the growers within the association a net gain of \$20 a thousand on these devices. This reduction is based on orders aggregating 250,000 for this district.

The whole nation is interested in this frost problem, which has been solved in our own state, and since the system of frost prevention has been developed and simplified in our own midst, every fruit state in the Union is interested in our success.

Readiness to admit an error or accept a suggestion has saved many a man from ruinous policy, and the same is true of communities.

We produce the antidote oil in our state, and the genius of one of our citizens has produced a simple means of applying this antidote so as to enable every fruit grower to avail of this means, to the end that he may bring the greatest good from the soil, with the certainty of a full crop of healthy fruit every year.

The Fruit Growers' Supply Company has taken this matter up in the right spirit of the greatest good to the greatest number. Now it is up to the growers to give their hearty co-operation by signing up for the required number of heaters for their varied individual needs, and thus permit of early delivery and installation in the orchards.—Pomona, California, Daily Review, September 10, 1910.



Los Angeles, California, August 31, 1910.

To All Stockholders:

In view of the great damage by frost during the last two seasons, the Fruit Growers' Supply Company appointed a committee consisting of F. Q. Story, W. G. Fraser, P. J. Dreher, A. F. Call and W. C. Hendrick to investigate and make report of the various methods of orchard heating. The report of this committee has been received, and they unanimously recommend the adoption of the Bolton orchard heater, which heater, sold by the Frost Prevention Company of Fresno, California, has the form of a truncated cone, flared to nest solid when stored, with carbureting air passages, and soot arrester to regulate combustion, and a cover to protect the fuel from dust and rain. This heater burns residuum, which is the ordinary California crude oil with the asphaltum base extracted, and which sells at 80 cents a barrel at Los Angeles. The committee report that it is their judgment, and the judgment of those who have witnessed the demonstrations with the Bolton heater, that it is the best and most efficient heater on the market; and that its points of superiority are: its fuel economy, the length of time that it burns, the small amount of soot given off, and its effectiveness in heating the lower air and preventing loss of heat from the ground. When filled with five quarts of residuum or fuel oil these heaters will burn seven to eight hours without attention, and placed 100 to the acre at intersections, with a few extra on the windward side, will give ample protection to fruit on frosty nights. It is estimated that two dollars an acre per night will cover the fuel cost for these heaters, and at this nominal expense every association orchard should be protected. Compared with the great benefit to be derived from the use of these heaters, the cost is nominal. The Frost Prevention Company agrees to guarantee that they will last five years with



When you get to Hood River
stop at the

MT. HOOD HOTEL

Trains stop directly in front
of hotel. Bus meets all boats

Automobile service daily for
Cloud Cap Inn during months
of July, August and September

Faculty Stronger Than Ever
More Progressive Than Ever

ATTEND THE BEST

Behnke-Walker Business College

PORLAND, OREGON

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

ordinary care. Tests and demonstrations of these heaters have been made at Pomona, Corona and Riverside, where the principal growers can and will give further information to all those desiring it.

Yours truly,

Fruit Growers' Supply Company,
By A. E. Barnes, Secretary,



WHEN IS AN APPLE BLOSSOM KILLED? Professor Weldon, in charge of the local experiment station of the State Agricultural College (Colorado), says that when showing pink an apple blossom can stand 20 above zero, and when in full bloom as low as 26. J. H. Sayles, of Palisade, one of the best known orchard men in the West, takes issue with the professor. "I have had apples, showing pink, seriously damaged at 26 above," said Mr. Sayles, "and in full bloom I have had them killed at 29. The amount of cold a bud or blossom can stand is dependent upon so many circumstances that it is never safe to take chances. When my blossoms are out I light my orchard heaters mighty soon after the thermometer gets below 32. A lower temperature than that might not hurt the blossoms, but I'm not experimenting with my fruit. I want a crop. It costs little to fire my heaters, and to be on the safe side means a full crop. Any orchard man is foolish who takes chances." The agricultural experiment bulletin, showing results of experiments with various fruits, states that blossoms will withstand cold as follows: Apples, showing pink, 20 above zero; in full bloom, 26 above zero; pears, showing pink, 20 above zero; in full bloom, 27 above zero; peaches, showing pink, 23 above zero; in full bloom, 28 above zero. Mr. Sayles holds that only in exceptional cases will the blossoms withstand the cold above indicated, and that any farmer who depends upon those figures is likely to lose his crop.—Denver Republican.



STATE AND DISTRICT FAIRS

October 10-15—Idaho Inter-Mountain Fair, Boise, Idaho, Will H. Gibson, secretary.

October 1-7—Missouri State Fair, Sedalia, Missouri, John T. Stinson, secretary.

October 3-8—Spokane Inter-State Fair, Spokane, Washington, R. H. Cosgrove, secretary.

October 3-8—Utah State Fair, Salt Lake, Utah, Horace S. Ensign, secretary.

October 6-15—Alabama State Fair, Birmingham, Alabama, F. P. Chaffee, secretary.

October 10-15—Arkansas State Fair, Hot Springs, Arkansas, Geo. R. Belding, secretary.

October 10-15—Lewiston-Clarkston Fair—Lewiston, Idaho, C. W. Mounts, secretary.

October 15-30—State Fair of Texas, Dallas, Texas, Sidney Smith, secretary.

October 17-22—North Carolina State Fair, Raleigh, North Carolina, Jos. E. Pogue, secretary.

A splendidly referenced, graduate horticulturist, practiced on irrigated and nonirrigated lands, desires a position.

Address A. G.
Care "Better Fruit"

WHAT \$100 WILL DO FOR YOU IN TEXAS

It will buy one gold bond bearing eight per cent interest and \$50 stock in new company and one town lot in Aldine, near Houston, the greatest city in the Southwest. Terms either cash or monthly. Full particulars free. Address E. C. Robertson, general sales manager, 501 Kiam building, Houston, Texas.

FOR SALE

Nearly new, full platform spring, Stubbebaker wagon, 12-foot bed; bought for handling fruit, been replaced with auto truck; cost \$320; will sell for \$250. W. J. YOUNMANS. Inquire 115 Union Avenue South, Portland, Oregon. Phone E 343.

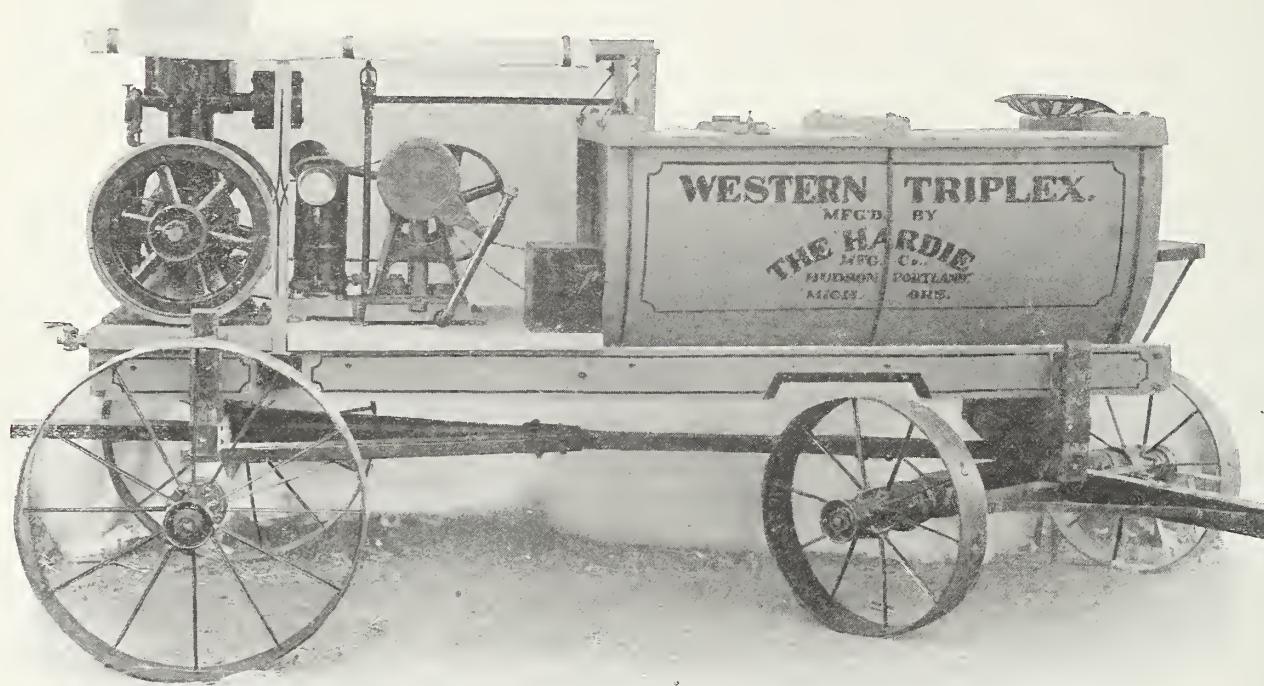
TWIN FALLS

THE MAGIC CITY

Why not invest and live in a country that has made good and has a bright future? Where farming and fruit growing make a man rich and contented in a few years? Come and see! Write for booklet.

Secretary Commercial Club
Twin Falls, Idaho

The Hardie Triplex



From Maine to Washington, the Hardie Triplex Sprayer is working successfully. Our model for 1911, shown in the cut above, gives you an idea of the completeness of this machine.

Small details, which tend to perfect it in usefulness and completeness, are carefully looked after.

We give you a machine ready to run every minute you need it, doing efficient work for you all the time, and with

Nothing to Watch but the Spray

Light in weight, compactly built, efficient in every way, don't buy till you see the HARDIE TRIPLEX.

Our new catalog is now ready, showing over twenty different styles of hand and power spraying machines, nozzles, hose, etc.

Last spring when looking for a sprayer we looked at all the sprayers on the market and decided on the Hardie as being the machine suitable for our work. Before buying we were told by some that the brass cylinders on the Hardie pump would not last and would be soon eaten up by the action of the spray material. After a season's use we can say that the cylinders are as good as when the machine was taken out. The machine has been exceedingly satisfactory in every respect and has done all you claimed for it. You may use our names as reference at any time.

Wenatchee, Washington.

P. J. Morris.
J. R. Phipps.

The Hardie Triplex Sprayer I purchased this spring has given the best of satisfaction and I do not hesitate in recommending it to every one as the best power sprayer on the market. On account of its low build and light weight it can be taken into orchards where no other power sprayer would go without tearing the trees and knocking off the fruit. I have not paid out one cent for repairs this year.

Cashmere, Washington.

Dr. H. J. Whitney.

Send for Our Catalog Today

The Hardie Manufacturing Company

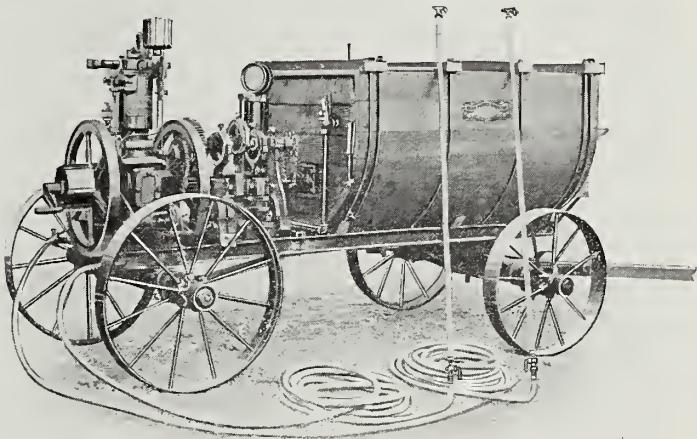
Hudson, Michigan

49 Front Street, Portland, Oregon

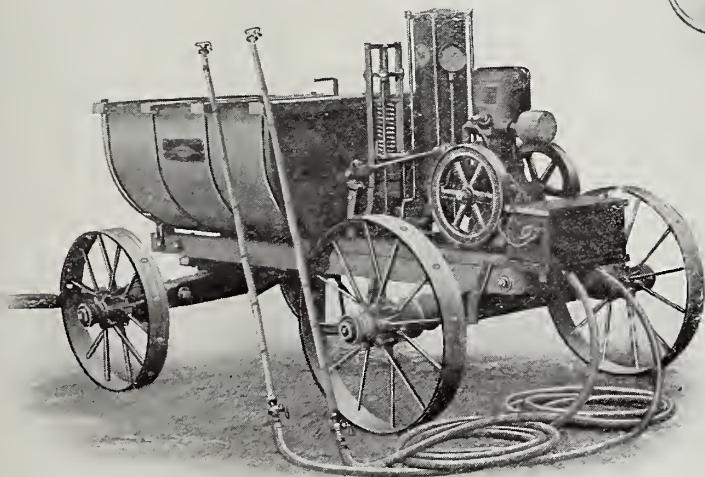
BEAN POWER SPRAYERS

Strong Compact Light Weight Efficient Durable

THE BEAN GIANT OUTFIT NO. 124—For use when an outfit of the largest capacity and highest quality is desired. Weighs 450 pounds less than last year's outfit, yet is just as substantial, rigid and durable. All-steel platform, instead of wood. Low truck, which means easy hauling and perfect adaptability to hilly ground. It has a capacity of from $7\frac{1}{2}$ to $10\frac{1}{2}$ gallons a minute at a constant pressure of 200 pounds. Write to us or see your nearest Bean agent.



The Bean Giant Outfit No. 124



The Bean Pony Outfit No. 140

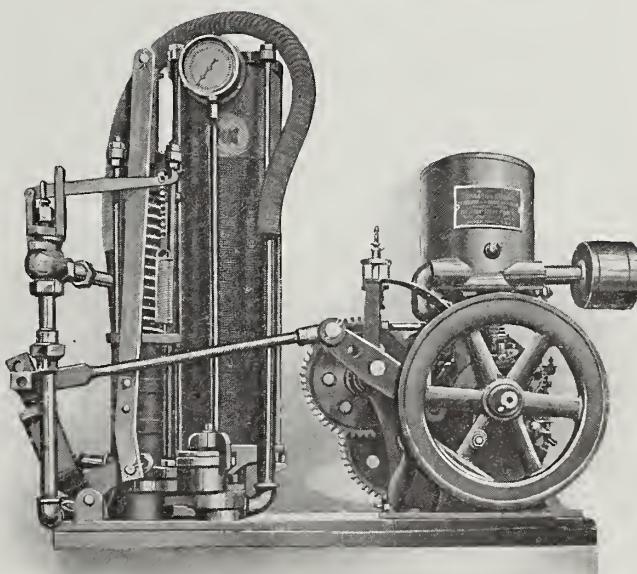
BEAN POWER SPRAYERS HAVE high or low wheels; wide or narrow tires; cover or no cover; two or four lines of hose; one, two or three horsepower engine; wagon with or without brake; magneto or battery; any kind of spray nozzles; any length of spray rods or hose; and almost any equipment you may want.

SEND FOR OUR 1911 CATALOG—It is the most complete book on hand and power sprayers we have ever issued. Illustrates and describes in detail our new Pony Outfits, the Bean Giant, the Challenge, the Bean Magic, and all our outfits, new nozzles and accessories. Send your name for a free copy.

Bean Spray Pump Co.

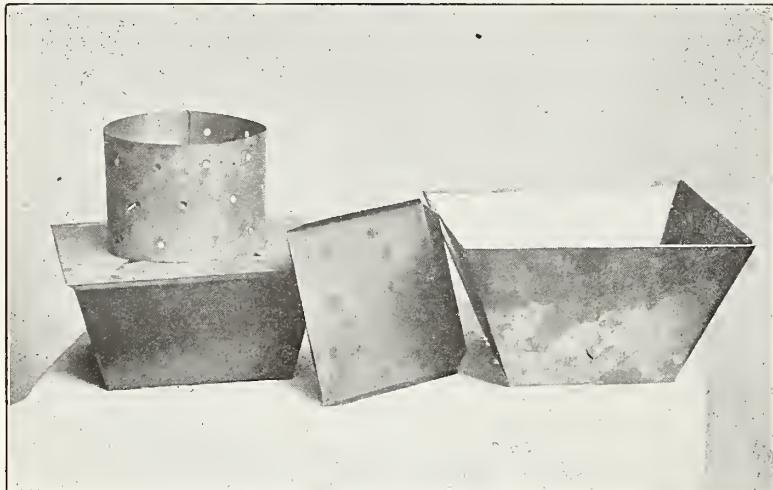
SAN JOSE, CALIFORNIA

Also Cleveland, Ohio



The Bean Pony Outfit No. 142

Not a Dissatisfied Customer!



Where used as represented by the manufacturers, the

National Heater

stands supreme today in economy and efficiency.

Burns 40 per cent less oil than any other heater generating the same amount of heat.

Maximum consumption of carbon, as it does not burn direct from the oil, and thus eliminates soot and saves fuel.

Capacity, 6 quarts. Burns 7 to 12 hours.

REMEMBER—There will be times when you will need eighty heaters per acre to protect your crop. We have always recommended that number, and now most growers admit we have been correct. Get ready now to insure your crop of next season by buying the National Heater. Place orders early to insure getting them in time for use.

CALL ON OR WRITE US FOR CIRCULAR AND PRICES

THE NATIONAL ORCHARD HEATER CO.

Grand Junction, Colorado

PRACTICAL SUGGESTIONS ON ORCHARD HEATING

BY A. C. LONG, MANZANOLA, COLORADO

PERHAPS there is no greater danger confronting the fruit growers of the United States just at the present time than the danger of losing their crop of fruit, and even trees, by late frosts or freezes which occur in the spring, frequently after fruit has budded, or is even in bloom. Therefore, practically every fruit grower where this damage has occurred, is turning his attention to some means of protecting his fruit from this danger. The conditions causing this loss are frequently only of from one to three hours' duration, and as a means of overcoming this difficulty, orchard heating (or sometimes called smudging) has

become quite general in Colorado, and I wish to say the results obtained surpass all former expectations, fruit being saved by this means against a temperature as low as seventeen degrees above zero, or fifteen degrees below freezing.

As a fruit grower I look upon this subject as a matter of great interest to the industry, and I will offer the following explanation of the methods I employed:

Having two orchards in this vicinity, I decided to heat ten acres of each orchard, consisting of various varieties of trees, and secured satisfactory results with the minimum number of heaters to

For a Base Burner in
Your Orchard

Get an

Olson
Orchard
Heater

For Sale by

The Colorado
Fruit & Commercial
Company

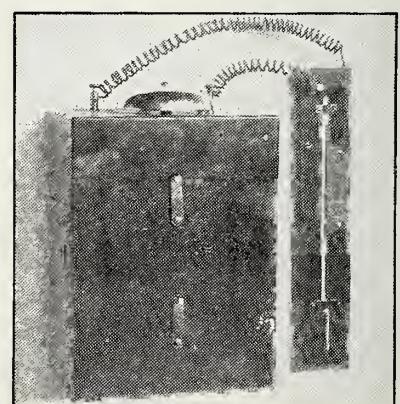
Grand Junction, Colorado

The Cederborg Frost Alarm

Will wake you up in time

It can't fail, it rings if out of order. Send your name now to get information about Frost Alarms, Green House Alarms, Tested Thermometers for Orchard Use, Etc.

The
Cederborg Engineering Co.
808 Twentieth Street, Denver, Colorado



WE KNOW YOU CAN SAVE YOUR FRUIT CROP BY THE USE OF

IDEAL COAL HEATERS

How can you afford to take chances on losing a valuable crop?

In asking you to install Ideal Orchard Heaters we make the following four claims:

First, We claim there are more Ideal Coal Heaters in use in Colorado and Utah than any other make of orchard heater.

Second, We claim that a larger ratio of our customers saved their crops by their firing than were saved by the use of any other heater.

Third, We claim that our customers saved larger yields per acre than were saved by other orchard heaters.

Fourth, We claim our customers saved their crops with a far less expense per acre than where oil was used along side of them.

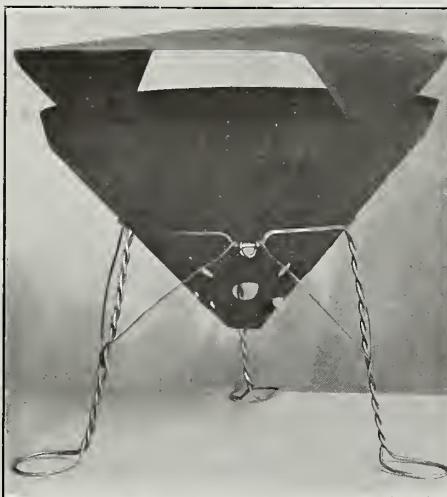
To substantiate these claims we will submit a list of our customers to a disinterested committee for verification.

A Reservoir Coal Heater

Self Feeding and Self Cleaning

That you may be at once convinced of the superiority of IDEAL COAL HEATERS, we will send you, upon receipt of 50 cents, one of our fifty-pound all-night-burning heaters. Try this beside any other make of heater, and if you are not satisfied that it is the best heater on the market we will refund your money.

Agents wanted—Send references.



The Ideal Orchard Heater Co.

Grand Junction, Colorado

Our space is too small to have our customers tell you how they saved thousands of dollars' worth of fruit with our heaters when the temperature fell to 18 above zero. We will be glad to send you these talks in a letter. We claim:

QUICK HEAT GREAT VOLUME
BIG CROPS SAVED
ECONOMY EFFICIENCY
EASE OF OPERATION

the acre, getting a good setting of fruit on the earliest blooming varieties, which showed a total loss of fruit outside of the heated zone. In one orchard the self-registering thermometers showed nineteen degrees above zero, while those inside the heated zone registered twenty-seven and twenty-eight degrees above zero, respectively.

I used sixty-five oil heaters to the acre in one orchard and seventy-five to the acre in the other, with the best results with the last named.

In describing the operation of the oil heater, which is more generally used here, I will say that the oil burners are made to hold about one gallon of oil, which will burn from four to five hours without refilling. The oil most com-

monly used is what is called gas or smudge oil. It is the crude oil with the gasoline taken out, and is a cheap oil, costing as a rule from two and a half to three and a half cents per gallon in tank cars.

The length of time these heaters will burn depends largely upon the wind and the way they are operated, although there is seldom any wind to speak of at the time and the season of the year that this damage occurs. The heaters are placed in the orchard sometimes between the rows of trees, but usually under the tree, about three feet from the base, using about one heater to each tree. Some use less, some more, but I would recommend using at least one to the

tree, and lighting them as the temperature demands.

After the heaters are in place, they are filled with the oil, the usual method employed being to place one or two barrels on a sled. The barrels are then filled from a cement cistern that has been previously built, or from a tank, where the oil may be stored. A common suction pump may be used in filling the barrels. The barrels are then driven between the rows and the heaters filled from the barrel by means of a small vessel, something in the shape of a coal skuttle. Then the cover is placed on the heater and the flue is placed in position if it is necessary for you to begin lighting at once, but generally the heaters are placed in the orchard and filled

“SAVE-TIME” Folding Berry Boxes

Are ready any time. Quickly opened for use
When set up they are set up for good, and remain so until used
One piece bottom. No defects. Simply perfect

Manufactured by

PACIFIC FRUIT PACKAGE CO.

Raymond, Washington

H. B. HEWITT, President and Treasurer

J. H. HEWITT, Vice President

O. C. FENLASON, Secretary and Manager

Agents Portland, Oregon, Territory: STANDARD BOX & LUMBER CO., East Pine and Water Sts., Portland, Oregon

Agents Spokane Territory: WASHINGTON MILL COMPANY, Spokane, Washington

Hitch Your Hillside Spring or Mountain Stream to a Deming HYDRAERAM and Have an Automatic Water-Works System of Your Own

How are you using that spring or stream on your land? Is it doing you any particular good? Have you ever considered seriously how you might use it to make things easier around the house and the farm buildings—saving your wife many steps every day by supplying her with plenty of water in the kitchen and elsewhere, and making your own work easier by bringing it wherever needed about the barn or garden, or among the trees?

The Deming Hydraeram—the product of many years of development and improvement—is an automatic machine which pumps water by water pressure. When located where water from a spring or stream can descend abruptly to it for several feet, it will force part of that water to a point higher than the spring itself and to a much greater distance.

In first cost, the Deming Hydraeram is scarcely more than one-fifth the price of a power pumping outfit; it requires practically nothing in the way of attention or repairs. When once in place and properly regulated, the Deming Hydraeram will operate steadily, month after month, so long as the stream that feeds it continues to flow. This machine is substantially constructed of brass and iron, and will generally run for many years before any parts need to be renewed.

You may have a spring or stream on *your* land which would be ideal for the installation of a Deming Hydraeram. If so, we would like to hear from you—to know where it is located; how far from your house or wherever you wish to use the water; about how much it flows per hour; in short, all the particulars you can give us concerning it. We want to show you, without any obligation on your part, how the Deming Hydraeram will reduce the labor and expense connected with securing your water-supply—no matter what method you are now employing.

Upon receipt of this information, we will answer promptly; if the conditions are favorable to installing a Deming Hydraeram, we will tell you just what it would cost, complete. If it is not practical for you to use one, we will tell you so, frankly. In either case, you are placed under no obligation whatever by writing. We are specialists on water-supply, and are very glad to answer your questions.

The well-known Deming line of pumping machinery includes Hand and Power Pumps for all uses, including irrigating, farm and household water-supply systems, and, in case you cannot profitably use a Hydraeram, we will gladly recommend a suitable hand or power outfit, with prices, if you so desire.

The 1911 Catalogue of Deming Spray Pumps, Nozzles and Spraying Accessories will be ready soon. You will want to see it before you order that new outfit; drop us a line now and we will send a copy as soon as ready. Address our nearest office.

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Spray Pumps and Nozzles, Hand and Power Pumps for All Uses

This outfit is useful for irrigating above a canal, or the water from the machine may be used upon the lands below.



The Hydraeram may be set in a "battery" of two or more, each having its separate drive pipe and discharging into one delivery pipe.

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several days in advance. In this case the flue is dropped inside the heater into the oil, the cover placed over, making it tight and keeping out rain or dust.

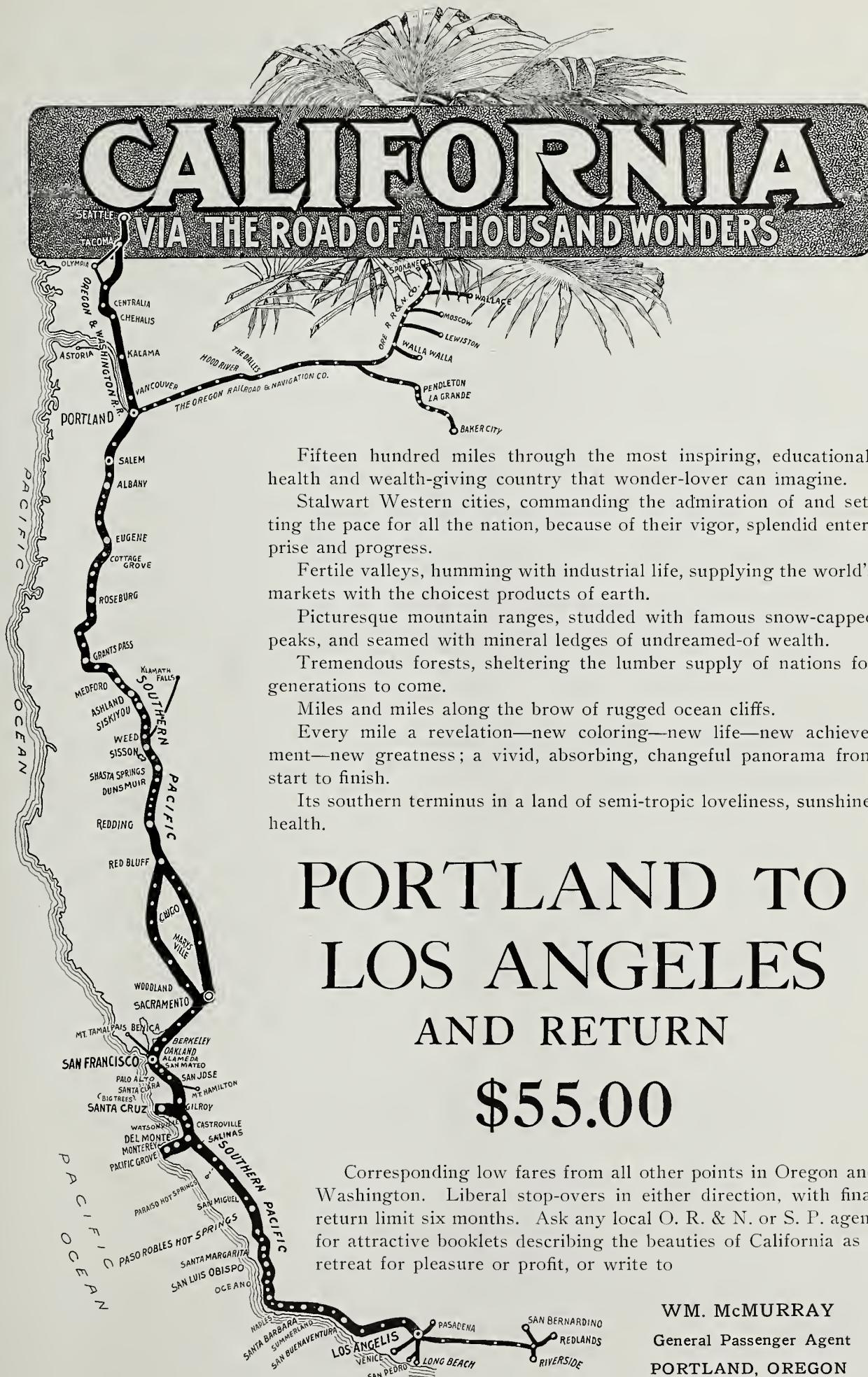
When you are ready to light, take off the cover, take out the flue, and place both in position; then you are ready for lighting, which is done by preparing the wick. This is done by making a sort of a wad or ball out of waste, old rags or burlap, and wrapping around it a piece of wire, leaving one end of the wire about two or three inches long and making a hook at the end. One of these should be made for each heater, and they can be made in a very short time and at practically no cost. They should be thrown into a vessel and coal oil

poured over them, remaining there until you are ready to light. Then a man takes these wicks and hangs one on each heater by hooking the end of the wire into one of the draught holes on the cover.

Now the worst is over, and the lighting is a small job. The lighting is done by a man or a boy walking down the rows of heaters with a lighted torch and applying it to each wick as he passes. The wicks being saturated with coal oil, they can be lighted as fast as a man can walk. After the wick has created sufficient heat on top of the oil to cause the gas to rise, the heater burns the gas and the wick is required no longer, although it is not in the way if you prefer to leave it.

The heater in operation can be regulated to burn fast or slow, and burning proportionately less oil, by moving the flue over the draught hole to suit the occasion.

I have described more fully the accompanying cut, but all oil burners are operated in a similar manner, it simply being a question in your own mind as to which is the best. It is the general opinion that orchard heating is a success, but I would not attempt to go about it in a slip-shod manner as some do, nor take the recommendation of some, that any old heater is sufficient, for what is worth doing is worth doing right, and orchard heating is a scientific operation and is no boy's play.—Fruit Grower, St. Joseph, Missouri.



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NORTHWEST GROWERS' UNIONS AND ASSOCIATIONS

WE PUBLISH free in this column the name of any fruit growers' organization. Secretaries are requested to furnish particulars for publication.

Oregon

Eugene Fruit Growers' Association, Eugene; Ashland Fruit and Produce Association, Ashland; Hood River Fruit Growers' Union, Hood River; Hood River Apple Growers' Union, Hood River; Grand Ronde Valley Fruit Growers' Union, La Grande; Milton Fruit Growers' Union, Milton; Douglas County Fruit Growers' Association, Roseburg; Willamette Valley Prune Association, Salem; Mosier Fruit Growers' Association, Mosier; The Dalles Fruit Growers' Union, The Dalles; Salem Fruit Union, Salem; Albany Fruit Growers' Union, Albany; Coos Bay Fruit Growers' Association, Marshfield; Estacada Fruit Growers' Association, Estacada; Umpqua Valley Fruit Growers' Association, Myrtle Creek; Hyland Fruit Growers of Yamhill County, Sheridan; Newberg Apple Growers' Association, Newberg; Dufur Valley Fruit Growers' Union, Dufur; McMinnville Fruit

Growers' Association, McMinnville; Coquille Valley Fruit Growers' Union, Myrtle Point; Stanfield Fruit Growers' Association, Stanfield; The Oregon City Produce Association, Oregon City; Lincoln County Fruit Growers' Union, Toledo; Rogue River Fruit and Produce Association, Medford; Mount Hood Fruit Growers' Association, Sandy.

Washington

Kennewick Fruit Growers' Association, Kennewick; Wenatchee Fruit Growers' Union, Wenatchee; Puyallup and Sumner Fruit Growers' Association, Puyallup; Vashon Island Fruit Growers' Association, Vashon; Mt. Vernon Fruit Growers' Association, Mt. Vernon; Spokane Fruit and Vegetable Growers' Association, Spokane; White Salmon Fruit Growers' Union, White Salmon; Thurston County Fruit Growers' Union, Tumwater; Bay Island Fruit Growers' Association, Tacoma; Whatcom County Fruit Growers' Association, Curtis; Yakima Valley Fruit and Produce Growers' Association, Granger; Buckley Fruit Growers' Association, Buckley; Lewis River Fruit Growers' Union, Woodland; Yakima County Horticultural Union, North Yakima; Ever-

green Fruit Growers' Association, R8, Spokane; Lake Chelan Fruit Growers' Association, Chelan; Zillah Fruit Growers' Association, Toppenish; Kiona Fruit Growers' Union, Kiona; Mason County Fruit Growers' Association, Shelton; Clarkston Fruit Growers' Association, Clarkston; Prosser Fruit Growers' Association, Prosser; Walla Walla Fruit and Vegetable Union, Walla Walla; The Ridgefield Fruit Growers' Association, Ridgefield; The Felida Prune Growers' Association, Vancouver; Grand View Fruit Growers' Association, Grandview; Spokane Valley Fruit Growers' Company, Spokane.

Idaho

Southern Idaho Fruit Shippers' Association, Boise; New Plymouth Fruit Growers' Association, New Plymouth; Payette Valley Apple Growers' Union, Payette; Parma Roswell Fruit Growers' Association, Parma; Weiser Fruit and Produce Growers' Association, Weiser; Counsil Valley Fruit Growers' Association, Counsil; Nampa Fruit Growers' Association, Nampa; Lewiston; Lewis Orchards Producers' Association, Lewiston; Boise Valley Fruit Growers' Association, Boise, Idaho, Fremont Wood, president, H. E. McElroy, secretary.

Colorado

San Juan Fruit and Produce Growers' Association, Durango; Fremont County Fruit Growers' Association, Canon City; Rocky Ford Melon Growers' Association, Rocky Ford; Plateau and Debeque Fruit, Honey and Produce Association, Debeque; The Producers' Association, Debeque; Surface Creek Fruit Growers' Association, Austin; Longmont Produce Exchange, Longmont; Manzanola Fruit Association, Manzanola; Delta County Fruit Growers' Association, Delta; Boulder County Fruit Growers' Association, Boulder; Fort Collins Beet Growers' Association, Fort Collins; La Junta Melon and Produce Company, La Junta; Rifle Fruit and Produce Association, Rifle; North Fork Fruit Growers' Association, Paonia; Fruita Fruit and Produce Association, Fruita; Grand Junction Fruit Growers' Association, Clifton, Palisade, Grand Junction; Palisade Fruit Growers' Association, Palisade; Peach Growers' Association, Palisade; Colorado Fruit and Commercial Company, Grand Junction; Montrose Fruit and Produce Association, Montrose; Hotchkiss Fruit Growers' Association, Hotchkiss; Paonia Fruit Exchange, Paonia; Colorado Fruit Growers' Association, Delta; Crawford Fruit Growers' Association, Crawford; Manzanola Fruit Growers' Association, Manzanola.

Montana

Bitter Root Fruit Growers' Association, Hamilton.

Utah

Farmers' and Fruit Growers' Forwarding Association, Centerville.

Canada

Peachland Fruit Growers' Association, Limited, Peachland, British Columbia; British Columbia Fruit Growers' Association, Ladner, British Columbia.



SMOKE SAVED HIS APPLE CROP.—A Greencastle, Indiana, farmer, Mr. John McFarlan, does not believe in the fight being waged for the abatement of the smoke nuisance.

McFarlan's apple orchard is laden with an unusually fine crop this year, while every orchard in the neighborhood is almost barren of fruit. McFarlan believes smoke from Big Four locomotives on a siding near his orchard tempered the cold which killed apple blossoms in April and saved his crop.—Huntington, W. Va., Herald.

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Packers, Fruit Growers, Associations and Shippers, Write Us for Storage Rates, Etc.

Reference: State National Bank, St. Louis

PROTECTING FRUIT AND VEGETABLES FROM FROST

BY PROFESSOR A. G. McCADDIE, IN THE RURAL CALIFORNIAN

THE problem of protection from frost may be considered under four sections, as follows: (1) The issuance of adequate frost warnings; (2) a discussion of the physical processes operative in the formation and dissipation of frost; (3) the construction of devices and apparatus based upon the principles enumerated in No. 2; (4) the intelligent use of these devices so that a maximum efficiency may be obtained at the critical hour.

In California frosts are found to occur under pressure conditions similar to those shown on the departments' map. A period of strong north winds followed

by clear skies is a period of danger. Frost is essentially a problem in air drainage and some knowledge of the movement of the air over the ground, or in other words, the local air circulation, is essential for successful frost forecasting. The chief cause of cooling is undoubtedly radiation, and this is controlled to a large degree by the relative purity and stillness of the air. When, therefore, the lower strata are quiet and dust free, also vapor free, conditions are favorable for intense radiation; and consequently rapid cooling of both vegetable fibre and the soil. All fruit growers should carefully study the weather con-

ditions preceding frost in their localities.

Under the second heading, discussion of the physical processes involved in frost formation, we would call attention to the following ways of preventing the fall in temperature: (1) Adding heat; (2) adding water vapor; (3) adding both heat and water vapor; (4) ventilation, or mixing of the air; (5) irrigation, or use of water; (6) use of heated water; (7) use of screens or covers, preventing loss of heat by radiation; (8) spraying.

The action of water in any of its forms, whether solid, as ice or frost; fluid, as water; or gaseous, as water vapor, is protective. Large amounts of

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heat are given off in the change from vapor to liquid and from liquid to solid. Theoretically, it is possible by the application of sufficient water to prevent injury by frost. As the plant cools, owing to radiation, and an indraft of cold air, the vapor present condenses, giving free a large quantity of heat, sometimes 600 calories; and if the water turns to frost, more heat is set free, about 80 calories. If, for example, in an ordinary rain gauge enough frost has formed to weigh, when melted, about an ounce, then the latent heat of condensation is approximately 908 times 680, or 617,440 calories, enough to raise the temperature of the air at freezing four degrees over a space of ten feet square, and to a considerable height.

Note also that the water plays an important part when the sun rises and the warming of the vegetable fibre begins. Here the water retards the heating, and is thus beneficial. Chilled plants sprayed with cold water about sunrise are less liable to injury. The latent heat of evaporation and fusion now comes into

action in an opposite direction, the heat being utilized in changing the frost into water or the water into vapor. This, in the writer's opinion, is the critical period, and he believes that more injury results from the too rapid warming of plant fibre after it has been chilled, than from the chilling itself. He has known of cases where delicate flowers have been incased in ice and yet no injury resulted, largely because the thawing out was gradual. In examining many orchards it has been ascertained that the portion most exposed to the sun's heat in the morning is, other things being equal, the portion of greatest injury. Up to the present time the chief effort in frost protection has been to prevent loss of

J. M. Schmeltzer, Secretary

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heat by radiation from the ground; and protective methods have been rightly based upon the possible saving and storage of heat. But it may be a later stage, namely, the period of the chilled fibre. While it is not definitely known what action during frost causes the death of the cell tissues, whether it be a rupture of cell walls or a separation and withdrawal of water content, it would seem that we could not err in guarding the plant fibre from any strain due to rapid and unequal heating when in a chilled condition. Beginning before sunrise, some screen or covering should be interposed between the fruit and the sun's rays. For the reasons given above it is also advisable to apply water. It may interest fruit growers to point out to them that the actual temperature of the air is probably of less importance in frost formation than the cooling of the plant surface during radiation. Nearly all fruit growers now understand that after sunset, if there be no clouds present and but little motion of the air (though it is well to test this by watching the flow of smoke near the ground), the plant surface of the foliage of course intercepts heat from the ground, and so we seldom find frost forming under a tree. The convective currents of the air are generally sluggish and there is as a rule little mixing of the air strata, or no thorough circulation at such times. Helmholtz has shown that layers of air of different temperatures may lie close to one another without mixing, and indeed this is known to be the case not only near the ground but even in free air. Doubtless herein lies the explanation of the streakiness of frost. We have

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examined orchards which were apparently level; and yet upon close inspection it was found that although there was no noticeable slope of the ground, there were certain channels of air motion and certain stagnant zones. The frost streaks were found to coincide with the stagnant areas. Much, however, depends upon the nature of the radiating surface.

The warming or the chilling of the ground has not much effect upon the air at a distance of ten or twelve feet. That is to say, the rate of heat conduction from one layer to another is very low. Therefore it is not unusual on frosty nights to obtain readings of thirty-two degrees Fahrenheit at the ground, while at six to ten feet above the ground the temperature may be thirty-six degrees or thirty-eight degrees Fahrenheit.

Under the third head, viz., the construction of devices and apparatus for use in orchards, vineyards, gardens, etc., we believe that each local forecaster can contribute materially to successful work by examining *in situ* any device brought to his notice. It is suggested that he

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Toppenish, Washington
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read up the history of the wire coal baskets, first used by Edward Copely at Riverside, California; the use of oil by Everett at Arlington; the application of hot water, first used by Meacham; the smudge machines of Hall, Hammond and others; the oil pots; and the small, cheap, sheet-iron stoves in which briquettes are burned and which are now on the market. The methods of protection by covering, whether cloth or lath, should be looked into. The question of expense will determine the availability of the method. In California the diversity of interest is so great that no general recommendation can be given, and in each locality the local forecaster should fit the method to the fruit. In the Riverside, Redlands, Colton section the orange naturally claims first attention; at San Diego, both lemons and oranges; in the foothills of the San Joaquin, oranges; in the valleys, the raisin vines in the spring; in the Sacramento Valley, the garden truck; in the Bay valleys, the almonds against the late spring frosts; and in Northern California, the deciduous fruits. In all directions there is room for improvement, and not only in the construction of apparatus, but in the manner of application. Particularly valuable are cases where apparently effective devices fail to accomplish the desired protection. Such cases should be studied and the reason for the failure ascertained. This constitutes progress.

Under the fourth heading—the use of our knowledge so that a maximum good may result—much of what has been said above is applicable.

THE Sunnyside Nursery Company

Capital paid up, \$100,000

WE HAVE NO AGENTS
SELL DIRECT

GET our prices and save money. Trees first-class. We lead, others follow. Have several hundred thousand finest peach trees ever grown in the West. Cherry, pear and apple in numbers that foot up millions. If planted in a line would make over three rows, the usual distance of planting, from Seattle to New York city.

WRITE US AND MENTION
THIS PAPER

Main Office
SUNNYSIDE, WASHINGTON

A REPUTATION TO SUSTAIN

VINELAND NURSERIES COMPANY

PROPAGATORS OF

RELIABLE NURSERY STOCK

All stock budded from bearing Trees, Fruit and Ornamental

CLARKSTON, WASHINGTON

SOME OF THE LETTERS RECEIVED BY THE EDITOR

Hamilton, Montana, July 9, 1910.

Editor Better Fruit:

I have been a reader and subscriber to your magazine for the past three years and have thought for some time that I would write you and tell you how much I appreciate it. The first copy of "Better Fruit" that I ever saw convinced me that it was the magazine for anyone engaged in fruit growing, and since then the magazine has grown monthly, both in size and worth.

I get the subscription value out of your magazine many times over, and cannot understand why anyone engaged in the fruit business can afford to be without it.

Wishing you continued success in your good work, I remain, Yours very truly,

D. L. Woodruff.



Portland, Oregon, August 26, 1910.

Editor Better Fruit:

We beg to acknowledge receipt of yours of the 25th and thank you for calling our attention to the list of Northwestern nurseries.

In this connection we wish to congratulate you on the appearance of your August number. It is

certainly well gotten up and the matter it contains is of interest to every person engaged in any way in fruit raising. The publication certainly merits the success with which it is meeting. We are obliged to you for the marked copy sent us.

Yours truly,

Portland Cordage Company.



San Francisco, August 16, 1910.

Editor Better Fruit:

While I have always known that "Better Fruit" was a good advertising medium, I had no idea that it was so widely distributed and read. The article that we recently published regarding the corrugated cardboard cartons has brought us inquiries in surprising numbers from all over the United States. This information will no doubt be gratifying to you and other advertisers who use your columns. Yours very truly,

A. C. Rulofson.



American Consulate, Belfast, Ireland,

April 6, 1910.

Hon. H. C. Attwell, President of the State Horticultural Society, Oregon.

Dear Sir: I have great pleasure in forwarding you a clipping from a London paper concerning the proposed International Horticultural Exhibition to be held in May and June of the year 1912. I am sure this will be of special interest to the horticultural people of Oregon.

Great Britain imports of fresh apples each year, more than ten million dollars worth; of pears, more than two and a half million dollars; of plums, more than two million dollars. The total value of green and dried fruits imported into Great Britain amounts to over fifty million dollars per annum. There is also imported fruit juice, and other forms of fruit, to the amount of one million two hundred and fifty thousand dollars. This country is the greatest foreign market in the world for American fruits, and as soon as the Panama Canal is completed the opportunity for shipping Oregon fruits will be so materially increased that the markets of the state for fruit products will be unlimited. It will be of enormous value to Oregon to send to this exhibition all its finest displays in various departments of horticulture, and I have to suggest that it would be well worth while for you to endeavor to get the legislature at its next sitting to make a special appropriation for a proper representation of Oregon horticultural products at this great International Horticultural Exhibition. I am, Very truly yours,

H. B. Miller, Consul.



New York, July 18, 1910.

Editor Better Fruit:

Suppose you would not find it expedient to discuss dwarf apple trees in your paper.

It is claimed the dwarf apple trees, standard varieties, are better because you can: (1) Put 120 to the acre; (2) take care of the trees easily; (3) pick the fruit without trouble; (4) the fruit is

Columbia and Okanogan Nursery Company

Wenatchee, Washington

PROPAGATORS AND GROWERS OF

The Cleanest, Thriftiest, Best Rooted Nursery Stock in the

WORLD

WHOLESALE AND RETAIL

SEND US YOUR ORDER

Supplying Large Commercial Orchards a Specialty

QUAKER NURSERIES

We have a large stock of YELLOW NEWTOWN PIPPINS, SPITZENBERGS, JONATHANS, WAGENERS, ROME BEAUTIES, and all of the leading varieties of apples.

We also carry a heavy line of BARTLETT, COMICE AND BEURRE D'ANJOU PEARS.

A general stock of peaches, such as EARLY CRAWFORDS, ELBERTAS, LATE CRAWFORDS, FOSTERS, TUSCAN CLINGS, PHILLIPS, MUIR, EARLY COLUMBIA, Etc.

Small fruits in great abundance, STRAWBERRIES, BLACKBERRIES, RASPBERRIES, DEWBERRIES, GOOSEBERRIES, Currants, GRAPES.

H. B. PATTERSON, MEDFORD, OREGON,

Special Selling Agent for Southern Oregon.

C. F. LANSING, Salem, Oregon

NURSERY CATALOG

New, handsome, instructive, up-to-date, describing

Fruit and Ornamental Trees, Shrubs, Vines, Roses, Berry Plants, etc.

Free on request. Write now, mentioning this paper.

J. B. PILKINGTON, Nurseryman, Portland, Oregon

Hood River Valley Nursery Company

Route No. 3, Box 227

HOOD RIVER, OREGON

Phone 325X

Will have for fall delivery a choice lot of one-year-old budded apple trees on three-year-old roots, the very best yearlings possible to grow. Standard varieties from best selected Hood River bearing trees—Spitzenbergs, Yellow Newtowns, Orleys, Arkansas Blacks, Gravensteins, Baldwins and Jonathans. All trees guaranteed first-class and true to name. Start your orchards right with budded trees from our nursery, four miles southwest from Hood River Station.

WILLIAM ENSCHEDE, Nurseryman

H. S. BUTTERFIELD, President

SEEDS AND TREES THAT GROW

For 25 years we have supplied our customers in all States with Trees and Seeds that GROW. We carry a most complete line of Fruit and Ornamental Trees, Berry Bushes, Roses, Perennials, Bulbs, etc. Low prices. Best quality stock only. Pacific States varieties of Apples, best one year trees at \$6.00 per 100, Peaches, \$7.00 per 100. We pay freight on \$10.00 orders.

Also, very large and complete stock of Farm, Vegetable and Flower Seeds to select from. Strictly Upland-Grown Alfalfa Seed a Specialty. Write for big 112 page catalogue and Garden Book. Mailed FREE to anyone interested.

GERMAN NURSERIES & SEED HOUSE
Box 317 Beatrice, Neb.

GERMAN NURSERIES
BEATRICE, NEB.

PRUNE TREES AT 10c

For a limited time we offer first-class yearling prunes at 10 cents, fine stock. You planters who will set, now is the time to save money and secure best of stock. Order now, receive the benefit of this special rate before it is discontinued. We carry a full line of all stocks.

CARLTON NURSERY CO.

Carlton, Oregon

WHEN ARE YOU COMING WEST?

Fortunes are being made now by hundreds on small fruit ranches in the West. If you are interested in the famous fruit section about Hood River, Ashland, Medford and other equally famous sections, send in the attached coupon. It's the soil, climate, and scientific culture that makes Oregon and Washington apples famous.

The Pacific Monthly Company,
Portland, Oregon.

Enclosed is 25 cents, for which please send me three recent numbers about famous fruit sections of the West.

Name _____

BF Address _____

C. F. COOK, President and Manager

F. H. COOK, Treasurer

F. J. NEWMAN, Secretary

Rogue River Valley Nursery Co.

Incorporated

Growers of Reliable Nursery Stock

BULBS OF ALL KINDS

"WRITE FOR PRICES"

SEEDS OF ALL KINDS

Fruit and Ornamental Trees, Shrubs, Roses, Vines, Palms, Small Fruits, etc.

Phone 1201

Office 25 West Main Street

Medford, Oregon

superior in quality; (5) not threshed around by the wind; (6) bear in two years' time, etc.

Now, these are big claims, and Hood River experts ought to know whether these claims are unfounded or are absolutely correct. If you can give me any light on the subject would be obliged to you.

Yours truly,

W. S. Manners.



Chicago, July 16, 1910.

Editor *Better Fruit*:

Enclosed please find copy for a half-page ad which you can run for the next three issues in your paper.

We wish to state that the small ad we have been carrying in your paper has reaped a very satisfactory harvest, and we wish to compliment you upon the fact that apparently your subscribers are deep-thinking men of business integrity, as the business we have secured through your ad has been from a high-class of clientele.

Yours very truly,
H. Woods Company.

CARLOAD RATING IS REVISED

OFFICIAL announcement was made yesterday that the quality ratings, adopted at the request of last year's exhibitors, will apply only in the scoring of the carload entries at the third National Apple Show, November 14-19, and in no way affect the other displays.

The carloads are the big show features of the exposition and rivalry is keen for the championship honors in this class, but in the district displays ten-box, five-box, four-box, three-box, single-box and plate contests each variety stands on its own merits and is not affected by the quality ratings.

"Meetings to discuss the revision of the quality ratings will be held during the apple show again this year," said Secretary Ren H. Rice, "and this will be a most fitting time for growers and exhibitors to request the American Pomological Society

GET CATALOG AND PRICE LIST
420 Acres Devoted to Nursery Purposes

THE WOODBURN NURSERIES

Established 1863 by J. H. Settlemier

Grower of Choice
Nursery Stock

F. W. SETTLEMIER
Woodburn, Oregon

RICHLAND NURSERY
Richland, Washington
FRUIT TREES

Complete stock of leading varieties of Apples, Pears, etc.

WRITE US FOR PRICE LIST

To the Shrewd Business Man

A commercial orchard is a good income producer while you live, the best real estate agent you ever had when you are ready to sell, and a valuable asset to leave to your widow and orphans when you have reached the end of life's journey.

If an old reliable nursery is of any specific importance to the prospective planter, we kindly ask you to consider with us before buying your trees.

Albany Nurseries

(Inc.)
ALBANY, OREGON

Quality and Quantity
Leave no Question as
to Quotation

On our complete line of

FRUIT TREES
ORNAMENTAL TREES
AND SHRUBBERY

Salesmen wanted

Capital City Nursery Company
Salem, Oregon

The Shenandoah Nurseries

*Offer for Fall and Winter Trade
a Complete Assortment of*

IMPORTED FRUIT TREE STOCKS

Mahaleb, Mazzard, Myrobalan and Pear

APPLE SEEDLINGS

American and French Grown. All Grades. Straight or Branched

APPLE GRAFTS

Piece and Whole Root

FINE STOCK OF GRAPES, Currants AND GOOSEBERRIES

Strong, Well Rooted Plants

FOREST TREE SEEDLINGS

Carefully Grown and Graded

LARGE GENERAL STOCK

Send List for Prices

D. S. LAKE, Proprietor

Shenandoah, Iowa

To hundreds of responsible orchard planters throughout the entire country we have sent thousands of trees of the

Stark Early Elberta Peach

These peach trees were sent to growers interested in our Volunteer Experiment Department.

If you were favored with some Stark Early Elberta peach trees, we want your report and opinion. Give us your judgment of its value, also as to its season of ripening as compared with Carman, Alton, Elberta, etc.

The work of testing one new variety requires a great deal of time and attention to innumerable details, for a new fruit must be thoroughly tried and proven worthy in many different sections of the country before it is given a place. Stark Early Elberta has been tried from New York to California, from Michigan to Georgia, and with the exception of one grower it has been highly recommended. This is a splendid record when you consider the effect and changes which different climatic conditions and altitudes have on a variety, as well as the difference in personal taste.

Opinions from Two Authorities

ARKANSAS—I have the Elberta, Early Elberta, and Elberta Cling. Stark Early Elberta leads them all. It is the finest peach I have ever eaten. Beautiful on the outside and delicious on the inside. I shall buy only from your nursery after this.—P. B. Doby, Clark Co.

UTAH—Last summer I visited the orchard and nursery of Dr. Gleason of Davis Co., Utah, and saw the Early Elberta and Elberta growing side by side. At the time of my visit Early Elberta was ripe and in its prime, while Elberta was hard and green. Fully two weeks before Elberta would be ripe, I brought back with me several specimens of Early Elberta in order to test their keeping quality. Fruit was placed on a shelf in the office, subject to light and heat. The fruit lay there for two weeks in as good condition as when picked. After this it began to wither, but was still in condition to eat two weeks later, or a month after picked from the tree. The fruit dried up and is still on

the shelf—just a bit of gummy pulp around the stone. This habit of the Early Elberta tree appeared to me identical with the Elberta. Fruit in external appearance just the same, but in texture I believe Early Elberta has a little finer grain and not so much "rag." It is juicy and sweet, with bright yellow flesh and free stone; skin thin but strong, and is not too fuzzy.

I believe Early Elberta is one of the best varieties introduced since the first Elberta came. It will no doubt play a very important part in sections such as we have here, where growers do not want too many varieties but must have early and late kinds. In Early Elberta one has all of the good qualities of Elberta, and the additional feature of early ripening. When this is taken into consideration, and when it is planted along with the original Elberta, much of the strain and congestion which comes with peach harvest will be greatly reduced. The shipping season will be lengthened.—E. H. Favor, Horticulturist.

New Work

We have a number of rare and promising sorts we desire to send complimentary to planters who are co-operating with us on the volunteer experimental work of testing. The Experiment Stations are doing their work and doing it well but generally there are only one or two stations to a state. On our volunteer plan every neighborhood may be reached. This is the reason we are using this method for testing different varieties and in conjunction with you and the Experiment Stations we are getting exact and dependable information.

The Stark Year Book for 1910 and the new book for 1911 (now being compiled) are but a reflection of such records and such experience.

The Stark King Philip Grape

Notwithstanding the heavy late frosts this spring, the Stark King Philip is bearing fruit in our nurseries in Rockport, Illinois. All other varieties were injured by the spring freeze. In our nurseries practically every vine of Stark King Philip has two or three large bunches of magnificent grapes. Many authorities consider this grape the most promising in its class and it is to the grape family what the Delicious apple is to the apple kingdom.

Write for our new supplemental booklet.—Free. The Stark Year Book will be sent for 10 cents in stamps which covers only mailing cost.

Stark Bro's Nurseries & Orchards Co.
Louisiana, Missouri

to revise the entire scoring list and give Western apples the consideration to which they are entitled. The society will meet at Tampa, Florida, in January and a strong presentation should be made before it on this question.

"While there has been much discussion over alleged inequalities of the ratings the position of the National Apple Show trustees should not be misrepresented. The trustees are not growers nor exhibitors, and as the show is held in the interest of the growers at large, the trustees quite properly take the position that they should be guided in rules by the wishes of the majority of the exhibitors, as without them there could be no show. This fact has always been given first consideration in making up the rules."

The changes made in the score card for this year were those recommended by the convention of the exhibitors, held during the show last year, and in that convention the trustees took no part whatever.

In the carload contest the following ratings are to be used as a guide by the judges:

Arkansas	6-7
Arkansas Black	6-7
Baldwin	6-7
Ben Davis	4-5
Cox Orange Pippin	8-9
Delicious	8-9
Gravenstein	8-9
Grimes Golden	9-10
Jonathan	8-9
McIntosh Red	7-8
Northern Spy	8-9
Rhode Island Greening	7-8
Rome Beauty	6-7
Spitzenberg	10
Stayman Winesap	8-9
Tompkins King	8-9
Wagener	7-8
Wealthy	7-8
White Pearmain	8-9
Winter Banana	8-9
Winesap	8-9
Wolf River	5-6
Yellow Bellflower	8-9
Yellow Newtown	9-10
York Imperial	6-7

—Spokane Spokesman-Review.



THE next annual meeting of the American Association of Farmers' Institute Workers will be held at Washington, D. C., November 14 to 16, 1910. At the same place, and beginning November 16, will be held the annual meeting of the Association of American Agricultural Colleges and Experiment Stations.

This meeting promises to be one of the most important that the Institute Association has yet held. The relation of the Farmers' Institute to the work of the section of the Association of Colleges and Stations will be taken up for discussion, as well as the subject of young people's institutes and farmers' institutes for women.

Special effort should be made by institute directors and lecturers to be present and take part in the discussion of these topics.

GRASS SEED

Let us send you samples of our new vigorous crop grass seed—ready for immediate shipment. Lilly's Best Grass Seed is reliable, of high germination and cleaned by our up-to-date machinery. We have an expert grass seed tester who analyzes every sample sent us and every pound we offer for sale, not alone to comply with the pure seed law, but that we ourselves are satisfied that the seed is GOOD.

Send For Fall Catalog.

This is what one customer says:— "I have used your grass seed and have had fine results. It was the nicest and cleanest seed I have ever used."

A. L. GROSS
Starbuck, Wash.

For prices and samples
Write

Chas. H.

Lilly Co.

Seattle

**LILLY'S
BEST
SEEDS**

NORTHERN
GROWN

For over a decade the leading seedmen of the Northwest



One of Our Blocks of Apple Trees, Showing Some of the Trees Offered Below

Plant Harrison's Apple Trees This Year; Our Method of Growing Develops Splendid Root and Top, and Clean, Healthy Wood Every Time

You know about Harrison's Nurseries, of course, and the wonderfully successful trees grown there; now we want you to CLINCH what you have heard, and PROVE these good facts for **yourself**, by ordering Harrison Apple Trees for your new planting this fall.

If you question whether our trees are suited to your locality, we're ready to demonstrate to you that they **are**; if you want to know whether we have the necessary facilities and equipment for growing trees the right way, and shipping them promptly for such long distances, we'll "show you" to your entire satisfaction.

Our Nurseries occupy over 2,000 acres, in one of the best tree-growing sections of the world. We have a regular little army of skilled workers, with dozens of teams and the best equipment, to do the work necessary to produce first-class trees.

No matter where grown or planted, good trees must have good roots and good tops—and ours do; over here on the Maryland Peninsula we produce trees with the finest roots you ever saw. The light soil encourages their formation and we keep them developing by intense cultivation all summer.

The result is a wealth of roots which in turn produce firm, healthy wood and a tree well fitted to bear abundant crops of fancy and choice grades of apples. We use clean seedling stocks and obtain our buds from fruiting trees that we **know** are true to name, and healthy.

SIZES AND PRICES—One-Year Budded Apple Trees, 5 to 6 ft., 4 to 5 ft., 3 to 4 ft., 2 to 3 ft.

		Varieties marked "X" are especially recommended for western orchards		Wealthy				
Baldwin	- - -	15,000						3,000
Ben Davis	- - -	10,000	Hyslop	- - -	200	Red Astrachan	- - -	15,000
Dutchess	- - -	5,000	Fall Pippin	- - -	500	Rhode Island Greening	- - -	2,000
Early Harvest	- - -	15,000	x Jonathan	- - -	15,000	x Rome Beauty	- - -	7,500
Early Strawberry	- - -	500	x Mammoth Black Twig	- - -	2,000	Stark	- - -	8,000
Gano	- - -	3,000	x McIntosh Red	- - -	20,000	Stayman's	- - -	12,000
Golden Beauty	- - -	400	Missouri Pippin	- - -	400	Sweet Bough	- - -	500
Grimes' Golden	- - -	10,000	Northwestern Greening	- - -	2,000	Transcendent	- - -	500
SIXTY-TWO OTHER LEADING VARIETIES RANGING FROM ONE HUNDRED TO FIVE HUNDRED EACH								

PRICES OF THE ABOVE TREES

	Each	10	100	1,000		Each	10	100	1,000		
5-6 feet	- - -	\$0 35	\$3 00	\$25 00	\$200 00	3-4 feet	- - -	\$0 25	\$2 00	\$15 00	\$125 00
4-5 feet	- - -	30	2 50	20 00	150 00	2-3 feet	- - -	16	1 50	12 00	100 00

Address Desk 8

Fruit and Ornamental
Trees, Shrubs,
Plants and Vines

Harrison's Nurseries
J.G. HARRISON & SONS
BERLIN
PROPRIETORS
MARYLAND

Two Thousand Acres in
Nursery. Catalogues
Free on Request

BETTER FRUIT

THE ALL OREGON FRUIT SHOW—PREMIUM LIST

THE quarter centennial celebration and annual meeting of the Oregon State Horticultural Society will be held in Portland, November 30 and December 1 and 2, 1910. The All-Oregon Fruit Show will be held on the same dates in the Armory, Tenth and Couch streets, and exhibitors are requested to notify the secretary of the society, Frank W. Porter, room 2 Lumberman's building, Portland, of the probable size of their displays, so racks and tables may be in readiness. Every fruit grower in the state is urged to make some showing from the orchard or vineyard. If box exhibits cannot be sent, at least enter into the plate contest.

Fine lithographed diplomas and ribbons will be given all prize-winners. Following is the list of prizes:

Best Twenty-five Boxes of Apples—First, \$100 cash and Horticultural Society diploma; second, \$75 cash and Horticultural Society diploma; third, \$50 cash and Horticultural Society diploma; fourth, \$25 cash and Horticultural Society diploma. The above premiums donated as follows: Portland Commercial Club, \$100; Meier & Frank Company, \$50; Oregon Hotel, \$50; Imperial Hotel, \$25; Bushong & Company, \$25. The Horticultural Society desires to send to Macy & Company, Broadway, New York, a part of the exhibition, and for that reason those winning the prize are expected to

turn over to the society as follows: On first prize, ten boxes; on second prize, seven boxes, and on third prize, three boxes; or more, if exhibitor is willing.

Best Five Boxes (not more than two boxes of each variety)—First, \$50 cash, by Hazelwood Cream Store; second, silver medal; third, bronze medal.

Best Five Boxes Spitzberg—First, \$50 cash; second, silver medal; third, bronze medal.

Best Five Boxes Yellow Newtown—First, \$50 cash; second, silver medal; third, bronze medal.

Best Three Boxes Spitzberg—First, \$25 cash, donated by Fred A. Jacobs Company; second, silver medal; third, bronze medal.

Best Three Boxes Ortley—First, \$20 cash, donated by Butterfield Bros.; second, silver medal; third, bronze medal.

Best Three Boxes Wagener—First, silver cup, \$20, donated by G. Heitkemper Company; second, silver medal; third, bronze medal.

Best Three Boxes from Mosier District—First, \$25 cash, donated by Portland Hotel; second, silver medal; third, bronze medal.

Best Three Boxes from Willamette Valley—First, \$20 cash, donated by Mason Ehrman Company; second, silver medal; third, bronze medal.

Best Two Boxes (One of Each Variety) Grown West of Cascade Mountains and West of West

Which Wagon Would You Choose

This letter from Guy L. Shaw, of Beardstown, Ill., explains these two photographs: "Enclosed find photograph of a Davenport Steel Wagon and an ordinary wooden wagon—exactly how they looked after doing the same work, over the same roads, with the same loads."

Mud does not stick to Davenport wheels—but that's only one of the reasons why you should choose

The Davenport Roller-Bearing Steel Wagon

Roller bearings mean 30% to 50% lighter draft. Guaranteed to carry 5,000 pounds. Gears solid steel, trussed like a bridge. Steel wheels, strong spokes, forged into hubs and hot-riveted to tires. Nothing to shrink, rot or work loose. Oil without removing wheels. One Davenport lasts a lifetime. Don't buy any wagon till you write us. Be sure to ask for Free Package No. 22

Davenport Wagon Co.,
Davenport, Ia.



ORCHARDIST SUPPLY HOUSE

FRANZ HARDWARE CO.

Hood River, Oregon

HEADQUARTERS FOR
CENTURY SPRAY PUMPS
Hose, Nozzles, First-class Plumbing Supplies
C. F. SUMNER
Successor to Norton & Smith
HOOD RIVER, OREGON

RESOURCES AND OPPORTUNITIES

There is more doing in the West today in the way of progress and development than in any other section of the United States. If you are interested and want further information about opportunities and resources of a vast new empire, use the coupon.

The Pacific Monthly Company,
Portland, Oregon.

Find enclosed 25 cents, for which please send me three recent numbers containing articles about resources and opportunities in the West.

Name.....

BF Address.....

Seeds

THE KIND YOU CAN'T KEEP IN THE GROUND

They grow, and are true to name.
Write for prices on your wants.

J. J. BUTZER Portland, Oregon

Poultry Supplies, Spray, Spray Materials, Fruit Trees, Etc.

CLARK'S CUTAWAY TOOLS

LESS WORK

Drawn by two medium horses. Will cut 28 b. 30 acres or double-cut 15 acres in a day. Will move 15,000 tons of earth one foot in a day. Runs true in line of draft and keeps the surface true. All other Disk Harrows have to run in the half lap. Has Improved reinforced main frame, and improved standards. Don't be deceived by poor imitations or infringements. There's only one original Cutaway" and it's Clark's. Saves time. Saves labor. Saves money.

BIG CROPS

Crops increased 25% to 50%. Better Grain, better Hay, better Fruit. Takes place of Plow and Harrow. Jointed Pole takes all the weight off the horses' necks. We make 120 sizes and styles of Disk Tools. Every machine fully warranted. Thousands in use and giving satisfaction. If your dealer won't supply you, we will.

Send to-day for Free Booklet.
Cutaway Harrow Co.
940 Main Street
HIGGANUM, CONN.

Mitchell, Lewis & Staver Co., Western Agents, Portland, Oregon

Cupid Flour

Has same standing in the Flour trade that Hood River Apples have in the Fruit trade.

MADE BY

HOOD RIVER MILLING CO.

THROUGH THE SOUTH SEAS WITH JACK LONDON

Jack London saw many strange sights in his year's cruise on the "Snark." Not all of us will have the opportunity of making such a voyage, but we can enjoy the enchantment and novelty of such a trip through the descriptions of such an artist as London. The series of travel sketches is running now. Send the coupon and get started right.

The Pacific Monthly Company,
Portland, Oregon.

Enclosed is 25 cents. Send three recent issues containing Jack London's South Sea articles.

Name.....

BF Address.....

SCOTT-MUNSELL IMPLEMENT CO.

321-329 East Morrison Street, Portland, Oregon

1018-1020 Sprague Avenue, Spokane, Washington

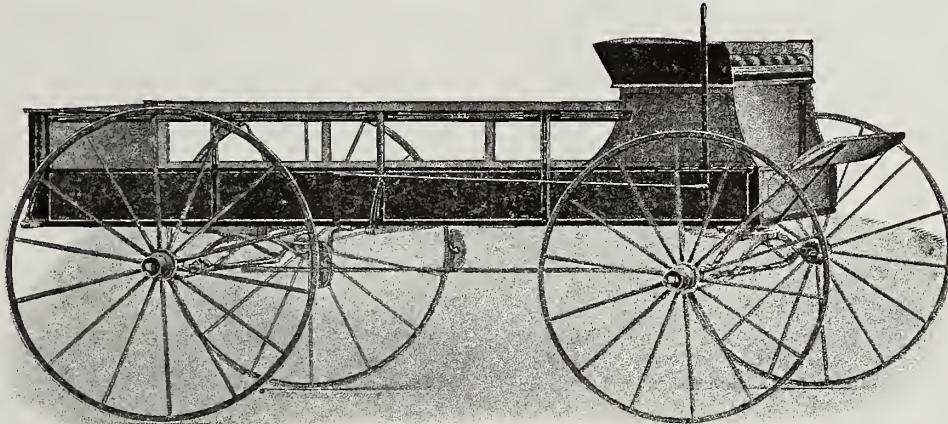
WHOLESALE AND RETAIL DEALERS IN

Vehicles and Implements

Carry large assortment of best styles of earth-working tools; also haying and harvesting machinery; also wagons for fruit delivery and for teaming; also driving vehicles for business and for pleasure uses.

WE RECOMMEND TO FRUIT GROWERS THIS WAGON NO. 120
MADE BY FREMONT CARRIAGE MANUFACTURING COMPANY

Bodies
42 inches
wide.
Have drop
end gate
with chains.
Hang low
on duplex
springs.



Uses the
celebrated
"Fitch Gear"
"Short Turn"
with
high wheels,
wide body
hung low.

Sizes: 1 1/8-inch, 1 1/4-inch, 1 3/8-inch and 1 1/2-inch axles. Bodies: 7-foot, 8-foot, 9-foot, 10-foot; 42 inches wide

THE NAME OF MAKERS IS GUARANTEE OF HIGHEST QUALITY

Line of Hood River County—First, merchandise or spray material, \$20, donated by Hardie Manufacturing Company; second, silver medal; third, bronze medal.

Best Two Boxes from Rogue River District—First, silver cup, \$20, donated by A. & C. Feldheimer; second, silver medal; third, bronze medal.

Best Commercially Packed Box from Williamette Valley—First, merchandise, \$10, donated by Polson Implement Company; second, bronze medal; third, diploma. Horticultural Society.

Best Box Grown East of Des Chutes River, Eastern Oregon Contest—First, \$10 cash, donated by Pacific Paper Company; second, bronze medal; third, Horticultural Society diploma.

Oregon Nursery Company prizes, \$100 in nursery stock, as follows:

Best Box Spitzenergs—First, \$25 worth nursery stock; second, bronze medal; third, Horticultural Society diploma.

Best Box Yellow Newtown—First, nursery stock, value \$25; second, bronze medal; third, diploma.

Best Box Jonathan—First, nursery stock, value \$25; second, bronze medal; third, diploma.

Best Box Baldwin—First, nursery stock, value \$25; second, bronze medal; third, diploma.

Best Box Baldwin Grown West of Cascade

Mountains and West of Hood River County—First, merchandise, value \$10, donated by Mitchell, Lewis & Staver Company; second, bronze medal; third, diploma.

Best Box Ben Davis—First, No. 500 Union family scales, donated by Fairbanks, Morse & Company; second, bronze medal; third, diploma.

Best Box Arkansas Black—First, barrel lime sulphur spray, donated by G. Stoltz Company; second, bronze medal; third, diploma.

Best Box Barnes—First, one Barnes compressed air spray pump, donated by Rice & Phelan, \$5; second, bronze medal; third, diploma.

Best Box Hydes King—First, \$10 cash, donated by Blake-McFall Company; second, bronze medal; third, diploma.

Best Box Jonathan, grown East of the Cascade Mountains—First, lime-sulphur spray, donated by Chas. H. Lilly Company; second bronze medal; third, diploma.

Best Box Northern Spy—First, 100 cherry trees, donated by J. B. Pilkington; second, bronze medal; third, diploma.

Best Box Winter Banana—First, Morris chair, value \$20, donated by William Gadsby; second, bronze medal; third, diploma.

Best Box Delicious—First, carriage robe, value

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Dean & Shaw

Electrical Supplies and Fixtures

Scientific Electrical Construction

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Hood River, Oregon

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When you want any kind of Orchard Tools come to me and get the Best



COLUMBIA RAMS

Make Arid Land Valuable

Cost about \$15.00 per acre of land
irrigated

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Tenth and Johnson Streets

Portland, Oregon

VEHICLES AND AGRICULTURAL IMPLEMENT

THE BEST OF
ORCHARD AND GARDEN TOOLS
A SPECIALTY

**GILBERT - VAUGHAN
IMPLEMENT CO.**
HOOD RIVER, OREGON

The Great Many-Purpose Irrigation Machine

It will cut your drainage ditches;
Stir your soil; Level your land;
Cut laterals; Cut your sage-brush;
Throw up dikes and grade roads;
Pick up dirt—carry it—and drop it
where you want it.

20th Century Grader

The Original One-Man Machine

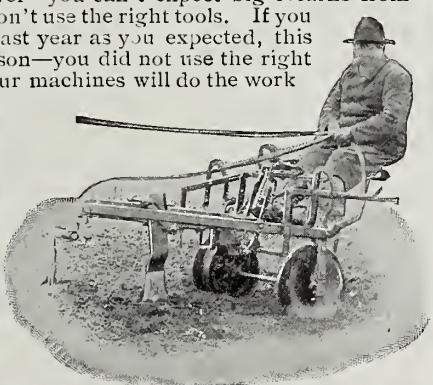
The 20th Century weighs but 600 pounds. One man with two or four horses operates it. Turns in 10-foot circle. Does twice the work of the big, heavy grader with four horses with half the effort.

Mr. Fruit Grower—you can't expect big returns from your work if you don't use the right tools. If you did not do as well last year as you expected, this is probably the reason—you did not use the right tools. If one of your machines will do the work of several expensive ones it means bigger profits at the end of the year.

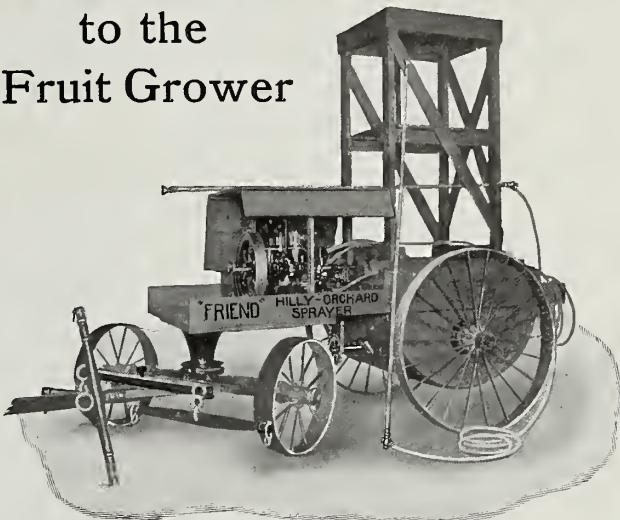
You shouldn't be without a 20th Century Grader on your place for it has a score of uses.

Let us tell you what others say of it. Send postal for detailed information about these wonderful machines.

THE BAKER MANUFACTURING CO., 742 Fisher Bldg., Chicago, Ill.



A Real "Friend" to the Fruit Grower



A hillside, low-down, short-turning Model Sprayer. Only one of the many good outfits made by the "FRIEND" Manufacturing Co., Gasport, N. Y.

The 1911 Models are now ready. They show new and novel features characteristic of these wonderful machines. Not every one is privileged to use the "FRIEND," only those who place their orders in time to insure delivery.

THOS. R. HANNA OF MARTINEZ

Colorado Representative:

MILLER & MATHEWS, PAONIA

California Representative:

diploma. Best box Yellow Newtown—First, \$15 cash; second, \$10 cash; third, diploma.

Lane County—Prizes offered by Eugene Commercial Club for fruit grown in Lane County, \$15, as follows: Best box from Lane County—First, \$10 cash; second, \$5 cash; third, diploma.

Linn County—Prizes offered by Albany Commercial Club, \$50, as follows: Best exhibit from Linn County—First, \$35 cash; second, \$15 cash; third, diploma.

Marion County—Prizes offered by Salem Board of Trade, \$25, as follows: Best exhibit from Marion County—First, \$15 cash; second, \$10 cash; third, diploma.

Apples on Plates—Fruit to remain property of exhibitor on plate exhibits: Best exhibit on plates—First, \$5 cash; second, silver medal; third, bronze medal; fourth, diploma. A first and second diploma will be awarded for the best plate of each of the following varieties: Arkansas Black, Baldwin, Ben Davis, Delicious, Gano, Grimes Golden, Hydes King, Jonathan, King, Northern Spy, Ortley, Red Checkered Pippin, Rome Beauty, Spitzenberg, Swaar, Vanderpool Red, Wagener, Winesap, Winter Banana, Yellow Bellflower, Yellow Newtown.

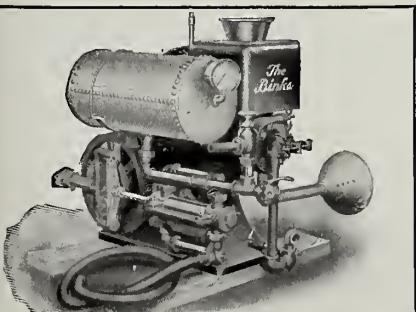
Largest Apple Exhibited—First, \$1 cash; second, diploma.

Best three boxes pears—First, \$25 cash; second, \$10 cash; third, bronze medal. Best box Winter Nelis—First \$15, donated by Schmidt Lithograph Company; second, bronze medal; third, diploma. Best box Buere d'Anjou—First, \$5 cash; second, bronze medal; third, diploma. Best box Comice—First, \$5 cash; second, bronze medal; third, diploma. Best box Buere Clairgeau—First, \$5 cash; second, bronze medal; third, diploma. Best box P. Barry—First, \$5 cash; second, bronze medal; third, diploma. Best exhibit on plates—First, \$5 cash; second, bronze medal; third, diploma. A first and second diploma will be awarded for the best plate of each of the following varieties: B. d'Anjou, B. Clairgeau, Comice, Winter Nelis, P. Barry.

Best collection of nuts—First, silver medal; second, bronze medal; third, diploma. For each of the following varieties, first, bronze medal; second, diploma: Franquette walnut, Mayette walnut, Praeparturien walnut, Barcelona filbert, Du Chilli filbert.

Best exhibit of dried fruits, berries and vegetables—First, solid silver gold plated medal; second, silver medal; third, bronze medal.

Best exhibit of dried prunes in boxes, commercially packed—First, \$5 cash; second, silver medal;

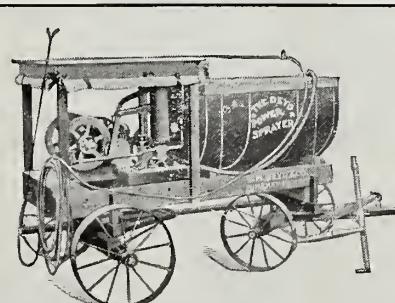


Binks Sprayers are Good Sprayers

Light, Compact, Simple and Durable
Illustrated Catalogue free for the asking

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Union Block, Seattle
Pacific Coast Distributors for
Binks Spraying Machine Co.



DEYO POWER SPRAYERS

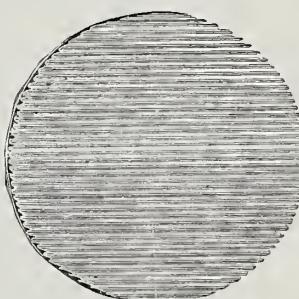
The first successful power spray outfit. Operated by either our 2 or 3-h.p. air-cooled engine. Nine years of success. If you do not know us, we refer you to thousands of the largest fruit growers. Satisfied customers are our reference. Outfit fully guaranteed. Write for Catalogue No. 20.

DEYO-MACEY ENGINE COMPANY
Binghamton, New York

APPLES OR PEARS

Should not be packed, when shipped in barrels, without the use of a

Corrugated Cap



The use of these Caps prevents having bruised or stem-punctured fruit on the face end of the barrel. About two million of these were used last year by the fruit growers and shippers. I can also furnish Corrugated Board for lining boxes, paper linings for boxes, pear and apple wraps, lithographed box labels, in fact, all the supplies used by the fruit growers and shippers.

Samples gladly sent upon request
Send for one of my booklets

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Get It Free

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Dairying	Fighting Frost
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Corn Crops	Cultivation
Stock Feeding	Cotton Crops
Art of Plowing	Soil Fertility
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Hired Help Costs Big Money

Your land is high priced and hired help expensive. There is only one way to make big money—use implements that cut down the cost of your crops. Isn't it true that when you break something on a plow it is nearly always a cast part? Wherever strain comes on a John Deere Plow there you will find steel—tool steel. Take any plow that has had hard work for five years, put it along side of a John Deere which has been in service that long—and see the difference. Then there is no paint to cover up poor material. You can see the wear and the defects. The John Deere will be solid, staunch and ready for the hardest job. Then you begin to know that quality counts.

You can take pride in owning a John Deere—the standard plow of the world for two generations.



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Package No. 46

Mention the package number *sure*, then you will get exactly the right stuff.

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Direct to You"
TRADE MARK REGISTERED

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The secret of getting the most for your money—in all stoves and ranges, including gas stoves and ranges—is in buying **direct from the factory** that puts high standard into materials, expert labor and heat and fuel-saving original designs—cutting out all dealers' and middlemen's profits. That's why Kalamazoo save you from \$5 to \$40 on price for stoves and ranges of equal quality sold by dealers. We don't sell to dealers—only direct to the users. All Kalamazoo sent ready to use and handsomely blacked and finished. We are proud to refer you to as many as you wish of over 140,000 satisfied owners of Kalamazoo in over 21,000 towns—probably including many of your own neighbors, or near you. Every one bought Kalamazoo direct from us, safe delivery guaranteed.

FREIGHT PREPAID —ON 30 DAYS' FREE TRIAL —ON 360 DAYS' APPROVAL TEST

We even give credit now—same as your dealers would—to responsible persons—small payment first and then monthly payments after your free trial, if satisfied. Or your payment back and we take our Kalamazoo back and pay freight both ways. You'd be nothing out at all.

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Spend a cent for a postal and send your name for our Big Free 100 page Kalamazoo Illustrated Book with wholesale factory prices, explaining all, with our \$100,000 bank bond guarantee of satisfaction or money back.

Judge first of values—then order—you be the one to say, if you don't want to keep the Kalamazoo we'll send you.

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KALAMAZOO STOVE COMPANY
Kalamazoo, Michigan

Over 100
Pages of Stoves and Ranges Shown in Our Big FREE Catalogue



third, bronze medal. Best commercially packed 25-pound box—First, bronze medal; second, diploma. Best commercially packed 10-pound box—First, bronze medal; second, diploma. Best commercially packed box of each of the following varieties: Italian, Petite, Silver, Willamette—First, bronze medal; second, diploma.

Dried prunes on plates (one pound to plate)—First, silver medal; second, bronze medal; third, diploma.

Best exhibit dried berries—First, silver medal; second, bronze medal; third, diploma. Best exhibit of each of the following: Blackberries, loganberries, phenomenal berries, red raspberries, black raspberries—First, bronze medal; second, diploma.

Best exhibit of dried vegetables—First, bronze medal; second, diploma.

The Portland Seed Company offers \$25 in merchandise as prizes as follows: Best exhibit of vegetables—First, \$15 merchandise; second, \$5 merchandise; third, \$3 merchandise; fourth, \$2 merchandise.

Best exhibit grapes—First, \$5 cash; second, \$3 cash; third, diploma. Best exhibit Concords—First, bronze medal; second, diploma. Best exhibit any other commercial variety of grapes—First, bronze medal; second, diploma.

Best jar of each variety of canned fruit shown—First, diploma.

For best box of any commercial variety not mentioned above, of either apples, pears, prunes or other fruit—First, diploma; second, diploma. For best plate of any commercial variety not mentioned above, of either apples, pears, prunes or other fruit—First, diploma; second, diploma. For best new seedling of any variety of fruit, either on plate or in box—First, diploma; second, diploma.

HARVEY BOLSTER SPRINGS

Soon save their cost. Make every wagon a spring wagon, therefore fruit, vegetables, eggs, etc., bring more money. Ask for special proposition. Harvey Spring Co., 181-17th St., Racine, Wis.



FREE TRIAL TO YOU

Acknowledgement—In addition to parties mentioned as donating prizes we wish to acknowledge donations from the following: Irwin-Hodson Company, \$25; Portland Printing Company, \$25; Front street merchants, \$15, as follows: Mark Levy, \$10; Levy & Speigl, \$10; McEwen & Koskey, \$10; Pearson-Page Company, \$10; F. H. Page, \$10; Dryer-Bollam Company, \$10; Bell & Co., \$10; W. B. Glafke Company, \$10; Davenport-Thompson Company, \$5; Davenport Bros., \$5; F. H. Schmalz, \$5; T. O'Malley Company, \$5; Columbia Fruit and Produce Company, \$5; Templeton Bros., \$5; Ben Levy, \$5. The Oregon Agriculturist will give one year's subscription to the winner of the second prize in each contest.

RULES AND INFORMATION

1. All boxed apples and pears must be wrapped, except top layer.
2. All apples entered in box competitions must be exhibited in boxes of one of the following dimensions, inside measurement: 9 3/4 x 11 x 20 inches (Oregon special box), or 10 1/2 x 11 1/2 x 18 inches (Oregon standard box), or 10 x 11 x 20 inches (California special box).
3. No fruit may be entered for more than one premium.
4. No exhibitor may make more than one entry for the same premium.

IF YOU WANT TO KNOW MORE ABOUT THE WEST,

Resources, opportunities, life, literature, etc., don't delay, but send the coupon at once. The West of today will astonish you. There is something doing in the empire beyond the Rocky Mountains that will interest you. Get in touch with a live land, where fortunes await the willing.

The Pacific Monthly Company,
Portland, Oregon.

Enclosed find 25 cents. Please send three recent numbers containing information about the West.

Name _____

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RHODES DOUBLE CUT PRUNING SHEAR

Pat'd June 2, 1903.

Dept.
W

RHODES
MFG. CO.,
GRAND RAPIDS, MICH.

THE only pruner made that cuts from both sides of the limb and does not bruise the bark. Made in all styles and sizes. We pay Express charges on all orders. Write for circular and prices.

BETTS FLUME CEMENT

STOPS WASTE OF WATER
PREVENTS EXPANSION AND
CONTRACTION
PRESERVES THE WOOD

Manufactured by
The
C. G. Betts Company
Spokane, Washington

5. All packages must have name and full address of exhibitor on package or box, also variety of fruit contained therein.

6. All fruit entered for prizes must be grown in orchard owned by exhibitor, or of which he is lessee, manager or acting as duly authorized agent, except where prizes are open to commercial clubs, counties or otherwise stated, and all fruit offered in competition for prizes is subject to rules herein.

7. Except as otherwise stated, in above premium list, exhibits winning a cash or merchandise premium will become the property of the donor of the premium, unless exhibitor elects to retain ownership and waive right to premium. This election must be announced in writing to chairman of exhibits committee not later than 12 o'clock noon, December 1. Exhibits winning medals or diplomas only remain property of exhibitor.

8. No exhibit may be removed from the hall without written permit of chairman of exhibits committee. No exhibit can be removed until end of the show.

9. All entries for a given premium shall be grouped together.

10. Fruit and other products intended for entry must be shipped by prepaid express, or delivered in person, to Oregon State Horticultural Society, Armory, Tenth and Couch streets, Portland, Oregon.

11. In making entries exhibitors must quote number of premium entered for and class, as shown in above premium list.

12. All entries must be in place in exhibit room by 6 p. m. Tuesday, November 29. The room will be open to exhibitors at 8 a. m. of that day, also on Monday, but will not be open to the general public until 10 a. m. Wednesday, November 30, unless the judges shall complete their work before that hour. Judging will begin at 8 a. m. Wednesday, November 30.

13. The exhibits room will be in charge of the chairman of exhibits committee, and the management will use all diligence to insure the safety of exhibits after their arrival and arrangement, but in no case will be responsible for any loss or damage that may occur thereto, and will not be responsible for any loss or damage to donors who fail to receive their fruit.

14. Intending exhibitors must notify the secretary, F. W. Power, room 2 Lumbermen's building, Fifth and Stark streets, Portland, Oregon, at the earliest possible date and at least a week in advance, stating number of premiums and class numbers for which they intend to compete and number of boxes or plates they will bring.

15. A plate of apples or pears shall contain five specimens. A plate of dried fruit one pound. Plates will be furnished by the society.

16. Plate exhibits will be judged according to the rules of the American Pomological Society.

17. In judging boxes of apples, points will be allowed as follows: Pack, 20; color, 20; uniform-

ity, 20; quality, 20; freedom from blemish, 20; total, 100 points.

18. All articles entered for prizes must be grown in Oregon.

19. All parties winning a prize, whether in cash or otherwise, will receive one of our fine lithographed diplomas of the Oregon State Horticultural Society stating the prize won. These diplomas are suitable for framing and will be a credit to all who win them and give something of permanent value in addition to cash received. This is an entirely new feature and the diplomas were secured by the society at considerable expense. All medals are donated by the society.

20. No entrance fee will be charged.

21. The judges' rulings will be final in every case. Protests against exhibits must be made in writing before 8 a. m. Wednesday, November 30, with the chairman of exhibits committee.

22. Entrance tags will be furnished by the exhibits committee. Apply to the chairman, when exhibit is brought.

"I HAVE SO LITTLE FUNGUS

That I cannot afford to mark my fruit with bordeaux," says Mr. George T. Powell, of Ghent, New York, a grower of fancy apples. "I have less scale and finer foliage than ever before."

Reason: Five years' consecutive use of

"SCALECIDE"

Cheaper, more effective, and easier to apply than lime-sulphur
Send for booklet, "Orchard Insurance"

PRICES: In barrels and half-barrels, 50c per gallon; 10-gallon cans, \$6.00; 5-gallon cans, \$3.25; 1-gallon cans, \$1.00

If you want cheap oils, our "CARBOLEINE" at 30c per gallon is the equal of anything else
B. G. PRATT CO., Manufacturing Chemists, 50 Church Street, NEW YORK CITY

SEND NOW

for samples of our "Diamond Quality" RE-CLEANED Farm and Field Seeds, Grasses, Clovers, Vetches, Alfalfa and Grains for
FALL SOWING

We have Special Mixtures for Special Purposes—

Dry Land Pasture Mixture, Wet Land Pasture Mixture, Special Mixture for Burned-over Land, Cover Crops for Orchards.

Tell us the nature of your soil and your local conditions. Over 20 years' experience right here in the Pacific Northwest qualifies us to advise you.

Ask for Catalog No. 200

PORTLAND SEED CO.
PORTLAND, OREGON



Malthoid Roofing



The dependability of Malthoid Roofing has been proven by special tests covering a period of many years.

Malthoid will last as long as the building it covers. It is inexpensive, easy to lay, and your roof troubles are over when Malthoid is laid.

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Send for it.

A new and valuable

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Cheerful

Homes

This booklet is

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HOOD RIVER SPRAY MFG. CO.

HOOD RIVER

Maker and Distributer of the Famous

Niagara Lime-Sulphur Spray

The leading fruit growers and fruit growers' associations of the Northwest use *Niagara* exclusively. *Ask them the reason why.* *Niagara* is made under special process originated by ourselves. The only known process by which is made a permanent, clear and reliable solution of lime and sulphur of sufficient strength to meet all requirements.

Now is the time to compare results of summer spraying with our kind, with those using the "just as good" kind. Look for fungus.

Write for Further Information

WHEREVER FRUIT EXCELS NIAGARA SPRAY IS USED

COOPER'S SPRAY FLUIDS

Read what Hood River says

Hood River, Oregon, November 27, 1909.
This is to certify that I have used Cooper's Tree Spray Fluids, VI, for killing San Jose scale and found it very effectual.

G. R. Castner, County Fruit Inspector.

APTERITE
THE SOIL FUMIGANT
DESTROYS INSECTS IN THE GROUND
REDUCES LOSSES SAVES PROFITS
IT WILL PAY YOU TO INVESTIGATE
Write for 1910 booklet (32 pages)
Testimony from fruit growers everywhere

Agent:

C. G. ROBERTS
247 Ash Street Portland, Oregon
Sole Manufacturers:
William Cooper & Nephews
CHICAGO, ILLINOIS

A NEW USE FOR ICE.—Lee Brings, a farmer who lives about a mile north of Little Canada, near the shores of Gervais Lake, in this state, not only saved his large crop of crab apples from destruction following the late freezing weather, but has probably established a precedent, by actually preventing his trees from blossoming until the winter weather is safely past.

Brings, who has lived in Minnesota all his life and knows its uncertain propensities, as spring approached, determined not to allow his apple trees to blossom until the season was well advanced. Therefore, early in March he began hauling ice from Lake Gervais, which he piled around the base of the trees, of which he has seventy-five.

The work was laborious, but he stuck to his task until every tree was surrounded by a layer of ice a foot deep. Other farmers stopped and gazed at what they thought was a very foolish trick, but Brings had spent many winters and summers in Minnesota, not to mention "early springs," and he warned his neighbors that he would have a chance to laugh later.

The action of the ice on the roots of the trees resulted in stopping the progress of budding and, while all the other apple and fruit trees on neighboring farms were blossoming joyfully a week or two ago, Brings had not even budded. The frost of a week ago damaged all of the trees in the state, but could not damage the Little Canada farmer's crop—for the trees hadn't started to grow—in fact, they stopped growing a month before. The ice was slowly melting, but Brings stood and watched the weather, telling his neighbors that "the last of winter has not been seen yet." How true his words were reports of the past few days show, and while hundreds of thousands of dollars' worth of fruit was destroyed, Brings' crop is just beginning to bud.

With the rising of the sun yesterday the last of the ice surrounding Brings' trees departed, and he now is certain that even if another "freeze" comes it will not hurt his crop, for the trees will not commence to blossom before May. In the immediate neighborhood, farmers have lost their entire crop, while Brings is patiently waiting to reap the reward of his energies of last March.—Mankato, Minn., Review.

Hemingway's ARSENATE OF LEAD

**A Perfect Product
Properly Packed
Honestly Priced**

*Guaranteed to meet
the requirements of the various
State Agricultural Authorities*

For Coast Prices and Supplies
Address the Agents

KERR, GIFFORD & CO.
Portland, Oregon

THE MIRACLE OF WATER

Millions of acres of raw land are being reclaimed in the West by irrigation. Water makes this desert waste the most fruitful land in the world. No magician has wrought such wonders with magic wand. Interested? Send the coupon.

The Pacific Monthly Company,
Portland, Oregon.

Enclosed find 25 cents, for which please send me three recent numbers telling about the Miracle of Water.

Name_____

BF Address_____



Do Not Buy Arsenate of Lead on Arsenic Contents Alone

As the name implies, Arsenate of Lead is a chemical combination of Lead and Arsenic, and the Lead has an important function in this combination.

It acts as a binder, holding the Arsenic on the foliage, destroying not only the insects on the foliage at the time the poison is applied, but those that put in their appearance later.

It forms a strong chemical union with Arsenic, reducing to the minimum soluble arsenic, which causes foliage injury. When used according to directions it will not injure the most delicate foliage.

GRASSELLI ARSENATE OF LEAD PASTE contains 15 per cent Arsenic Oxide, enough poison to kill, and about 40 per cent Lead Oxide, the maximum amount consistent with good mixing properties.

It complies in all respects with the most rigid requirements of federal and state laws governing the manufacture and sale of Insecticides.

Grasselli Arsenate of Lead

Kills all Leaf Eating Insects
Sticks to the Foliage
Does not Injure the Foliage
Mixes readily with Water

DISTRIBUTERS IN THE NORTHWEST:

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Inland Seed Co., Spokane, Washington
Hardie Manufacturing Co., Portland, Oregon
Samuel Loney & Co., Walla Walla, Washington
Hood River Apple Growers' Union, Hood River, Oregon
And in all consuming districts

WRITE THE ABOVE, OR OUR ST. PAUL OFFICE FOR
NEAREST DISTRIBUTER

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Established 1839
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Chicago, Ill., 2235 Union Court
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St. Louis, Mo., 112 Ferry Street

New Orleans, La.
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Birmingham, Ala.
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You Want the Best WE HAVE IT IN T R E E S

They have the highest possible developed root system. It's the root which counts

Mr. Buyer:

No matter what quantity you may require, let us figure with you on your wants for this season, or send for our price list, and if you entrust your order with us we feel certain of retaining you as a permanent customer.

You will get what you order

Yakima and Columbia River Nursery Co.

North Yakima, Washington

Selected Yakima Valley Fruit and Ornamental Nursery Stock
"NONE BETTER"

Salesmen — A few wanted. Write for terms

It's a Mathematical Proposition

THAT

$$\text{GOOD FRUIT} + \text{GOOD CUSTOMERS} = \text{GOOD MONEY}$$

It is up to every shipper to grade and sell his fruit according to Produce Reporter Grades and Trading Rules. Then his customers know what to expect, both as to the quality of the fruit and as to the Trade Rules that shall govern if any difference arises. Thus, both parties arrive at a common understanding, at the beginning of the deal, which does much to prevent future trouble.

Now as to the second factor in the equation, viz., **good customers**. The desirable customer is the one who has established a reputation for honorable treatment of his distant customers. The Produce Reporter Co.'s first object is to secure in its files the antecedent and to-date business history of all wholesale fruit and produce dealers (and allied lines) and to rate them accordingly by the following key:

XXXX, Excellent; ship open.

XXX, Good; ship draft on bill of lading.

XX, Fair; perhaps draft on bill of lading, perhaps bank guarantee, according to circumstances.

X, Cash before shipping.

X—, Let strictly alone.

The moral effect of this rating system is alone a powerful protective influence; add to it a well equipped Adjusting Department, prepared to inspect and adjust disputed shipments anywhere in the United States, and it completes a system worth your investigating.

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PRODUCE REPORTER COMPANY
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ETCHED PLATES**

We have installed the only etching machines in the State of Oregon

BLAST ETCHED cuts have a "Printing Quality" which has never before been obtainable with process engraved plates

They Cost the Same as the Other Kind

**WE MAKE THE CUTS
FOR BETTER FRUIT**

**Hicks-Chatten
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OUR NEW LOCATION IS THE SIXTH FLOOR OF THE
BLAKE-MCFALL BUILDING

Fourth and Ankeny Streets, PORTLAND, OREGON

**F.W. Baltes
& Company
invite your
inquiries for
Printing**

**SPECIALISTS IN THE ARRANGING
AND EXPEDITING OF FINE WORK**

Corner of First
and Oak Streets **Portland, Oregon**

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The largest commercial magazine in the West

Devoted to upbuilding Oregon and
the Pacific Northwest

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Portland, Oregon

ALDINE ORCHARDS INVESTMENT RECOMMENDED

HERE is no subject at present demanding more serious attention from the financial press than that which has to do with the safe investment of some of the large and small sums of money that have been lying idle in safety deposit vaults for the past two or three years. The country is again prosperous, and the timidity which characterized capital during the days the annual settlements were under consideration has been succeeded by a confidence which threatens to carry investors to the other extreme. Not a day passes that the mails of all our leading financial papers do not contain letters soliciting advice and information concerning the different classes of investment propositions now on the market. To all such inquiries that have been addressed to this paper, we have invariably replied that expert knowledge and assistance are necessary in this connection. The element of safety has, above all other qualities, to be considered in any sort of investment. There are also other details in regard to which the average investor has to depend upon the special knowledge and assistance of the newspapers and trade journals devoted to such subjects. In this connection conservative investors who read this paper regularly may be interested in the

proposition of the Aldine Orchards, E. C. Robertson, manager, 501 and 510 Kiam building, Houston, Texas. In the plan of this company you select your town lot, and the acre to be set in figs, pecans or oranges is assigned in the regular order as received. There is no delay for day of distribution, but possession of lot may be had at once. The acre is delivered as soon as planted, the March following date of purchase. The Aldine Fig Company contracts to fence, plow the land, make roads and streets, and set the acre in figs, figs and pecans, oranges, or oranges and pecans, without interfering with your business arrangements free of cost, and if you want the trees cultivated and the fruit marketed thereafter it will be done at reasonable rates. You get the very best to be had in South Texas orchards at Aldine.

By the time you are through paying on the monthly plan the fig and orange trees will begin to bear, and be worth at that time \$1,000 to \$1,500 per acre. In four to five years' time the net proceeds from the fruit will pay back all the money it cost you and yield 50 to 100 per cent annually on the investment. A single full crop of figs or oranges from your acres will more than pay the

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cost of the land and lot, and each year thereafter as long as you live, it will yield as large a crop as the preceding one, thus insuring an income for life. Better than planting cotton or corn every year. One acre of figs or oranges equals ten in grass or grain. This is no idle dream or wild-cat scheme, but all statements made by this company are guaranteed to be absolutely correct, or money refunded.

Fresh fruit and vegetables may be grown in the garden every day in the year at Aldine. You do not have to pay on contract during protracted sickness, or interest on notes. Your heirs will receive a clear warranty deed to both town lot and land in case of death, without further payment, on regular plan of \$10 down and \$10 per month.

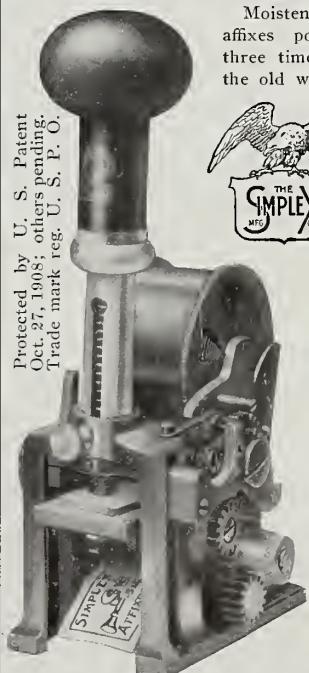
Ten per cent discount is allowed for cash, or \$207 buys both lot and land set to figs, and \$270 set to oranges, or pecans and oranges, and \$216 for figs and pecans.

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Five years from now the acre in bearing fig, orange and pecan trees, and town lot at Aldine, will be worth five times what it cost you now. There is no way for you to lose by this invest-

ment, and it is safer and more profitable than putting money in the bank, bonds or life insurance. The town lot you get at Aldine in a few years will be worth more than both the lot and acre in fig, orange or pecan orchard now cost. Houston suburban land is sure to become more valuable each year. The acre alone, without the figs, oranges or pecans, will soon sell for more than \$250. One acre of bearing Magnolia fig, Satsuma orange or paper shell pecan trees at Aldine is worth more than 100 acres in wild land remote from the railroad, or as many lots in some proposed town. Don't waste time and money on cheap wild-cat schemes.

The Aldine Canning and Preserving Company's plant will be erected in time for the crop of figs in 1911. It would have been useless to have put up this building the last year, as the local plant now in operation could easily take care of all the fruit, but it will be ready for operation this season, with one of the best equipped and largest fig preserving plants in this country. The company has decided to increase the capital stock and issue \$100,000 bonds, payable in ten years, bearing 8 per cent annual interest. From the sale of the bonds it will buy seven hundred acres of choice land and make all of the improvements necessary, with money enough to operate same successfully. The bonds are in denomination of \$100 only, and sold at par or face value. With each bond sold will be given a bonus of 50 per cent as much stock in this company and one town lot in Aldine. So that, if you buy a \$100 bond, you will get \$50 in stock free of cost and one lot 50x140. The bonds may be bought for cash or on time, to suit your convenience. All purchasers of Aldine orchards will be given \$25 in stock with each acre without further cost until 400 acres are sold. The company will allow you \$25 cash for same if you do not wish to keep the stock, to be applied on your purchase of Aldine orchards, and to be deducted from the last monthly payments. This is one of the best investments to be found anywhere, and every one who buys Aldine orchards will be fortunate indeed, for he will be assured of a local market for five years for his fresh figs at four cents per pound, with an interest in the finest preserving plant in that section, that will become more valuable each year. Much of the land to be owned by the new preserving company will be worth \$1,000 per acre, and all of it over \$200 within five years. It is altogether a conservative estimate that this company will own real property at Aldine worth \$500,000 within ten years after paying off the bonds. The demand for fig preserves is always greater than the supply, and steadily increasing. For further particulars not made plain by this free and unsolicited editorial, address E. C. Robert-

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THE SCENIC HIGHWAY THROUGH THE LAND OF FORTUNE

Parties anticipating preserving fruits and vegetables, or other products, for consumption or exhibition, should send 50 cents to A. W. Miller, 69 Fifth street, Portland, Oregon, for a copy of his booklet, entitled, “How to Preserve Food Materials for Display or Consumption,” containing some twenty-eight formulas for preserving fruit and vegetables, five for preserving fish, five for meats, and several for preserving eggs and milk, besides telling when, what and how to select your material, and how it should be handled, the size and pattern of jars best suited for certain material, also giving some fifteen valuable hints and helpful suggestions for success.

son, general manager Aldine Orchards, 501-10 Kiam Building, Houston, Texas.

In offering these bonds the company wants it understood that it makes no guarantee of any kind. The bonds have a lien on all the assets of the company and its earnings until the interest on same is paid. This property alone guarantees and safely secures the bonds of the company and makes the purchase of these bonds as safe an investment as can be found anywhere. As there is not a great many of these bonds to be disposed of, investors should not delay. The stock is valuable, the dividends will be large. No stock for sale without the orchards or bonds. Send in your subscription now, before it is too late, many of the town lots are worth the price of the bonds.

To the scores of people who have asked our opinion on the subject of investments, and to the thousands of others who desire to increase their resources, we would make the statement that in all things they will find the Aldine Orchard proposition above reproach and composed of business men whose every representation can be implicitly relied upon. The company needs no encomium at the hands of the Western Trade Journal, or any other paper, but in the interest of many of our readers who have sums of money to invest in legitimate propositions, we take pleasure in recommending them in the strongest and most unreserved manner as being beyond all question the best in their line. Investments in any sum can be made by writing to the above address, and we advise our readers to lose no time in placing their money where it will earn them at least 8 per cent right along.—Western Trade Journal.

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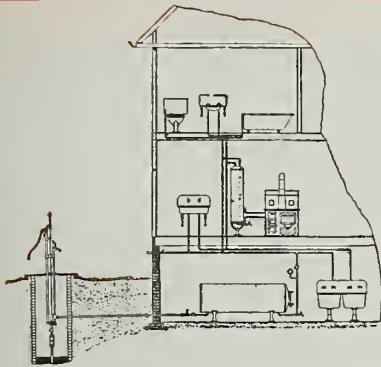
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